OMRON

Smart Sensors

Laser Displacement Sensors CMOS Type

ZX2 Series



User's Manual





CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Heiaht

Steps and Warpage Double Sheet Detection **PREPARATION FOR MEASUREMENT**

| Part Names and Functions | . 18 |
|--------------------------------------------------|------|
| Basic Configuration | 18 |
| Amplifier Unit | 19 |
| Sensor Head | |
| Calculating Unit | 22 |
| Installation | . 23 |
| Installing Sensor Heads. | 23 |
| Installing the Amplifier Unit | 25 |
| Connecting Calculating Units | |
| Connecting the Sensor Head to the Amplifier Unit | 28 |
| Wiring Diagram | . 30 |
| Wiring Input/Output Cables | 30 |
| I/O Circuit Diagrams | |

Meanings of Signal Words......8

Precautions for Correct Use 12

FLOW OF OPERATION

How to Use This Manual

| LOW OF OPERATION | 6 |
|------------------|---|
| | |



SPECIFI-

INDEX

SETTING TRANSITION CHARTS

DETAILED

Positioning Eccentricity and Surface Deflection

BASIC SETUP

| BASIC SETUP | 40 |
|---------------------|----|
| Display of RUN Mode | 40 |
| Simplest Setting. | 40 |

MAIN APPLICATIONS & SETTING METHODS

| Height | |
|------------------------|--|
| Steps and Warpage | |
| Double Sheet Detection | |
| Thickness | |

ZX2 User's Manual

14

CONTENTS

Introduction

| Positioning | |
|-------------------------------------|--|
| Eccentricity and Surface Deflection | |

DETAILED SETTINGS

| | | CONTENTO |
|-----------------------------------------------------|------|--------------|
| Smart Tuning | . 80 | CONTENTS |
| Selecting the Initial Sub-Display | . 84 | |
| Connecting Two or More Amplifier Units | | INTRODUCTION |
| Mutual Interference Prevention | . 88 | |
| Setting the Hysteresis | . 91 | PREPARATION |
| Setting the Hold Function | . 93 | FOR |
| Bank Setting | . 99 | MEASUREMENT |
| Zero Reset | 101 | FLOW OF |
| Scaling | 105 | OPERATION |
| Analog Output | 109 | |
| Output for Non-measurement | 111 | BASIC |
| Timer | 114 | SETUP |
| Setting the Differential Function | 116 | |
| External Input for Bank, Timing Input, Reset Input. | | MAIN |
| Setting the Detection Surface Selection. | | & SETTING |
| Key Lock Function | | METHODS |
| Initializing Settings Data | | Height |
| Induizing Coungo Bata | 0 | |

TROUBLESHOOTING

| Troubleshooting | 128 | Double |
|-----------------|-----|--------|
| Error Messages | 130 | Sheet |
| Q&A | 133 | |

SPECIFICATIONS

| Specifications and Dimensions. | | Positioning |
|------------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------|
| Amplifier Units | 138 | Eccentricity and Surface Deflection |
| Calculating Unit | | |
| Timing Charts | | DETAILED SETTINGS |
| Engineering Data (Reference Value) | 147 | SETTINGS |
| Angle Characteristic | 149 | TROUBLE- SHOOTING |
| Reference: Distance between two diffuse-reflective models that causes malfu tion when mutual interference prevention is turned off | | SPECIFI- CATIONS |
| INDEX | 152 | |
| Revision History | | INDEX |
| SETTING TRANSITION CHARTS | 158 | SETTING TRANSITION CHARTS |

Steps and

Warpage

Thickness

Introduction

understanding of the product.

engineering.

necessary.

CONTENTS

Thank you for purchasing the ZX2 Series Smart Sensor. This manual provides information regarding functions, performance and operating methods that are required for using the sensor.

The ZX2 Smart Sensor must be operated by personnel knowledgeable in electrical

To ensure correct use, please read this manual thoroughly to deepen your

Please keep this manual in a safe place so that it can be referred to whenever

When using the ZX2 Smart Sensor, make sure to observe the following:

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

ZX2 User's Manual

Warranty, Limitations of Liability

Warranties

Exclusive Warranty

Omron's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Omron (or such other period expressed in writing by Omron). Omron disclaims all other warranties, express or implied.

Limitations

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.

Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right.

Buyer Remedy

Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.

See http://www.omron.com/global/ or contact your Omron representative for published information.

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Limitation on Liability; Etc

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.

Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.

Application Considerations

Suitability of Use

Omron Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Omron will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Programmable Products

Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

Disclaimers

Performance Data

Data presented in Omron Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Omron's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Omron's Warranty and Limitations of Liability.

Change in Specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

| | Meanings of Signal Words | | | | |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------|--|--|
| CONTENTS | The following signal words are used in this manual. | | | | |
| INTRODUCTION | ^ | | Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in | | |
| PREPARATION For Measurement | | NING | serious injury or death. Additionally there may be significant property damage. | | |
| FLOW OF OPERATION | | | | | |
| BASIC | | N | Meanings of Alert Symbols | | |
| | The following a | lert symbols | s are used in this manual. | | |
| MAIN APPLICATIONS & SETTING METHODS | | | | | |
| Height | | Indicates | the possibility of laser radiation. | | |
| Steps and Warpage | | | | | |
| Double Sheet Detection | Indicates prohibition when there is a risk of minor injury from electrical shock or other source if the product is disassembled. | | | | |
| Thickness | <u> </u> | | | | |
| Positioning | | | | | |
| Eccentricity and Surface Deflection | | | | | |
| DETAILED SETTINGS | | | | | |
| TROUBLE- Shooting | | | | | |
| SPECIFI- CATIONS | | | | | |
| INDEX | | | | | |
| SETTING TRANSITION CHARTS | | | | | |

| Laser Safety | | CONTENTS |
|----------------------------------------------------------------------------------------------------------|---|----------------------------------------------|
| Sensor Head ZX2-LD50L, LD50, LD100L, LD100: Class 2 | | |
| | | PREPARATION For Measurement |
| Never look into the laser beam. Doing so continuously will result in visual impairment. | ^ | FLOW OF OPERATION |
| | | BASIC SETUP |
| Do not disassemble the product. Doing so may cause the laser beam to leak, resulting in the danger of | | MAIN APPLICATIONS & SETTING METHODS |
| visual impairment. | | Height |

Sensor Head ZX2-LD50V: Class 1

Do not disassemble the product.

Doing so may cause the laser beam to leak, resulting in the danger of visual impairment.



SETTINGS

and Warpage Double Sheet

Detection Thickness

Positioning

SHOOTING

SPECIFI-CATIONS

INDEX

In Europe, diffuse-reflective models in the ZX2 Series are categorized as Class 2 laser products and the regular-reflective model is classified as a Class 1 laser product according to EN60825-1 (see note).

In the U.S.A., diffuse-reflective models in the ZX2 Series are categorized as Class II laser

products, and the regular-reflective model is classified as a Class I laser product according to IEC60825-1 criteria, in accordance with the stipulations of the FDA standard

This product has already been registered with the CDRH (Center for Devices and

The ZX2 Series is meant to be built into final system equipment. Pay special attention to

The CE markings on the products also reflect these categorizations.

INTRODUCTION

CONTENTS

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Note:

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS Europe: Class 1 and Class 2 of EN 60825-1: 1994 +A11:1996 +A2:2001 = IEC 60825-1:1993 +A1:1997 +A2:2001 U.S.A.: Class I and Class II of FDA (21 CFR1040.10)

Place the laser warning label and the FDA label on the sensor.

Radiological Health). (Accession Number: 1020665)

the following precautions for the safe use of the product:

(1) ZX2-LDDDD emits visual laser beam. Do not stare directly into the laser.

Make sure that the laser beam path is terminated. If specular objects are present in the laser beam path, make sure that they are prevented from reflecting the laser beam.

When used without an enclosure, make sure the laser path from eye level is avoided.

- (2) To avoid exposure to hazardous laser radiation, do not displace nor remove the protective housing during operation, maintenance, and any other servicing.
- (3) As for countries other than those of Europe and the U.S.A., observe the regulations and standards specified by each country.

(4) Label Indications

Laser Notice No. 50 (see note).

The EN and FDA labels are supplied with the product.

Replace the current labels with them according to the instructions given in the manuals.

Precautions for Safe Use

Please observe the following precautions for safe use of the products.

Installation Environment

- Do not use the product in environments where it can be exposed to inflammable/ explosive gas.
- Do not install the product close to high-voltage devices and power devices in order to secure the safety of operation and maintenance.

Power Supply and Wiring

- The supply voltage must be within the rated range (DC12 to 24 V±10%).
- Reverse connection of power supply is not allowed. Connection to AC power supply is also not allowed.
- · Open-collector outputs should not be short-circuited.
- High-voltage lines and power lines must be wired separately from this product.
 Wiring them together or placing in the same duct may cause induction, resulting in malfunction or damage.
- Always turn off the power supply before connecting or disconnecting cables and connectors.

Applicable standards

- EN61326-1
- Electromagnetic environment : Industrial electromagnetic environment

(EN/IEC 61326-1 Table 2)

 There may be cases that current output or voltage output fluctuate within 1%F.S when a sensor is experienced electromagnetic interference under the condition of the response time 30µs.

Others

- Do not attempt to dismantle, repair, or modify the product.
- · Dispose of this product as industrial waste.

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Precautions for Correct Use

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS Please observe the following precautions to prevent failure to operate, malfunctions, or undesirable effects on product performance.

Installation of the Product

Installation Site

Do not install the product in locations subjected to the following conditions:

- Ambient temperature outside the rating
- Rapid temperature fluctuations (causing condensation)
- Relative humidity outside the range of 35 to 85%
- Presence of corrosive or flammable gases
- · Presence of dust, salt, or iron particles
- Direct vibration or shock
- Reflective sensor of intense light (such as other laser beams or electric arc-welding machines)
- · Direct sunlight or near heaters
- · Water, oil, or chemical fumes or spray
- · Strong magnetic or electric field

Component Installation and Handling

Power Supply and Wiring

- When using a commercially available switching regulator, make sure that the FG terminal is grounded.
- If surge currents are present in the power lines, connect surge absorbers that suit the operating environment.
- When connecting two or more amplifier units by using calculating units, make sure that the linear GND lines of the amplifier units are connected to each other. Supply power to all connected amplifier units at the same time.
- Before turning ON the power after the product is connected, make sure that the power supply voltage is correct, there are no incorrect connections (e.g. load shortcircuit) and the load current is appropriate. Incorrect wiring may result in breakdown of the product.
- The ferrite core accessory must be attached to the sensor head cable before use. (For how to attach the ferrite core, see pages 24 and 28.)
- The cables must be 10 m or shorter in total length for amplifier units. For extension
 of the cable of amplifier units, shielded cables of the same type must be used. To
 extend the cable from the sensor head, an optional extension cable (ZX2-XC□R)
 must be used. Only one extension cable can be used.
 - When using calculating units, make sure that the linear GND lines of the amplifier units are connected to each other.

Warming Up

After turning ON the power supply, allow the product to stand for at least 10 minutes before use. The circuits are still unstable just after the power supply is turned ON, so measured values may fluctuate gradually.

A warmup of at least 10 minutes is also required after canceling LD-OFF input if LD-OFF input is being used.

Sensing Object

The product cannot accurately measure the following types of objects: Transparent objects, objects with an extremely low reflective sensor ratio, objects smaller than the beam size, objects with a large curvature, excessively inclined objects, etc.

Mutual Interference

Inserting a calculating unit between amplifier units can prevent mutual interference between two sensor heads.

Maintenance

- Always turn OFF the power supply before adjusting or connecting/disconnecting the sensor head.
- Do not use thinner, benzene, acetone or kerosene to clean the sensor head and amplifier units. If large dust particles adhere to the front filter of the sensor head, use a blower brush (used to clean camera lenses) to blow them off. Do not blow the dust away with your mouth. To remove smaller dust particles, use a soft cloth (for lenses) with a small amount of alcohol. Take care not to wipe them off with excessive force.

Scratches on the filter may cause errors.

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

How to Use This Manual

CONTENTS

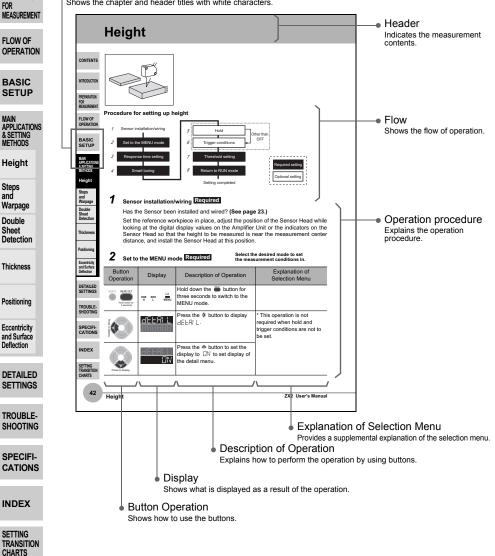
PREPARATION

Page Format

This section explains the page format by using the Setting for MAIN APPLICATIONS AND SETTING METHODS chapter as an example. INTRODUCTION

Index label

Shows the chapter and header titles with white characters.



Meanings of Symbols

| Symbol | Meaning | CONTENTS |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| Important | Indicates points that are important to achieve the full product performance, such as operational precautions and applica- tion procedures. | INTRODUCTION |
| (For details about xxx, see page xx.) | Indicates pages where related information can be found. | PREPARATION FOR MEASUREMENT |
| Required (white characters on a black background) | Indicates a required setting in a setup procedure. | FLOW OF OPERATION |
| Optional (black characters on a white background) | Indicates an optional setting in a setup procedure. | BASIC SETUP |
| Pres lo diguy | Indicates which button to press to display the menu shown in the Display column. | MAIN APPLICATIONS & SETTING METHODS Height |
| Press to select Menu name Select the | Indicates that the user can select the menu that accords with their usage conditions by pressing the relevant button. | Steps and Warpage Double Sheet |
| Change numeric value | Indicates that the user can specify a value that accords with | Detection Thickness |
| Press to set. | their usage conditions by pressing the relevant button. | Positioning |

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

CONTENTS

INTRODUCTION

PREPARATION For Measurement

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

PREPARATION FOR MEASUREMENT

| Part Names and Functions | 18 |
|--------------------------|----|
| Installation | 23 |
| Wiring Diagram | 30 |

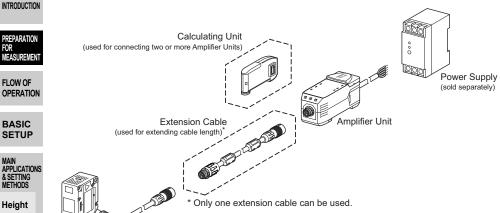
Part Names and Functions



For

Basic Configuration

The basic configuration of the ZX2 series Smart Sensors is shown below.



Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

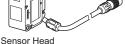
DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

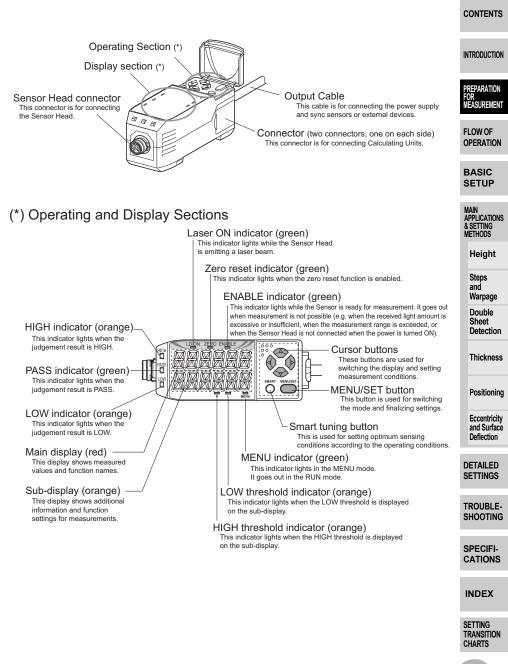
SETTING TRANSITION CHARTS



See the following pages for details:

| | Part Names and Functions | Specifications and Dimensions |
|------------------|--------------------------|-------------------------------|
| Sensor Heads | p. 22 | p. 138 |
| Amplifier Units | р. 19 | p. 136 |
| Calculating Unit | p. 22 | p. 143 |
| Extension Cables | — | p. 142 |

Amplifier Unit



Digital Displays

INTRODUCTION

PREPARATION For MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATION & SETTING METHODS Heiaht

Steps and Warpage Double Sheet Detection Thickness

Positioning Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-

SHOOTING

The information displayed on the main and sub-displays depends on the currently CONTENTS selected mode. The default mode is the RUN mode.

When the power is turned ON, the model of Amplifier Unit (ZX2-LDA) will be displayed on the main display and the channel number will be displayed on the sub-display. Subsequently, the Sensor Head software version will be displayed on the main display and the Amplifier Unit software version will be displayed on the sub-display.

These details are displayed for approximately five seconds, and then data for the RUN mode will be displayed.

| Mode | Main display (upper section, red) | Sub-display (lower section, orange) | | |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| RUN | The measured value (the value after the measurement conditions have been reflected) is displayed. For example, when the hold function is set, the held value will be displayed. Default measured values are as follows: | By pressing the \$ button, the HIGH threshold, LOW threshold, analog output value, resolution (max. value of measured value during one second - min. value), current value (value before execution of zero reset, hold, scaling and 2-sensor operation), and BANK are displayed in this order. | | |
| MENU | The function names are displayed in order by pressing the \$ \$ buttons. | The setting for the function displayed on the main display is displayed. | | |

(For details on setting transition charts, see page 158.)

Alphabet Display Format

The alphabet appears on the main and sub-displays as shown in the following table. SPECIFI-

| CATIONS | А | В | С | D | Е | F | G | Н | I | J | К | L | Μ |
|---------------------------------|---|---|---|---|---|---|---|---|----|---|---|---|---|
| INDEX | 8 | Ь | Γ | Ъ | Ε | F | Г | Н | | Ц | К | L | М |
| | Ν | 0 | Р | Q | R | S | Т | U | V | W | Х | Y | Ζ |
| SETTING TRANSITION CHARTS | N | | Р | Q | R | 5 | F | U | 1/ | K | Х | Ч | 2 |

Button Operation

The functions of buttons change according to the currently selected mode.

CONTENTS

| Button type | | Button function | | | | |
|---------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--|--|
| | | RUN mode | MENU mode | INTRODUCTION | | |
| to button | | Normal press: Changes the sub-display content.* Both to buttons held down for three seconds: Locks button operation. | Function changes depending on the setting. • Switches the function display. • Selects the digit of numerical values. • Stops setting. | PREPARATION FOR MEASUREMENT | | |
| Cursor buttons | Sutton | Normal press: Executes timing input. | The function changes depending on the setting. | OPERATION | | |
| Curs | | Held down for one second: Executes zero reset. Both buttons held down for one second: Cancels a zero reset. | Changes the selection menu. Changes numerical values. | BASIC SETUP | | |
| MENU/SET button | | Held down for 3 seconds: Changes the mode to the MENU mode. | Normal press: Finalizes the set condition or value. Held down for 3 seconds: Changes to the RUN mode. | APPLICATIONS & SETTING METHODS Height Steps | | |
| Smart tuning button | | Held down for one second, held down for three seconds, held down for five seconds: Executes smart tuning according to the time the button is held down. | Held down for one second, held down for three seconds, held down for five seconds: Executes smart tuning according to the time the button is held down. | and Warpage Double Sheet Detection | | |

* For how to select the initial sub-display to be displayed when the power is turned on, see page 84.

Positioning

Eccentricity and Surface Deflection

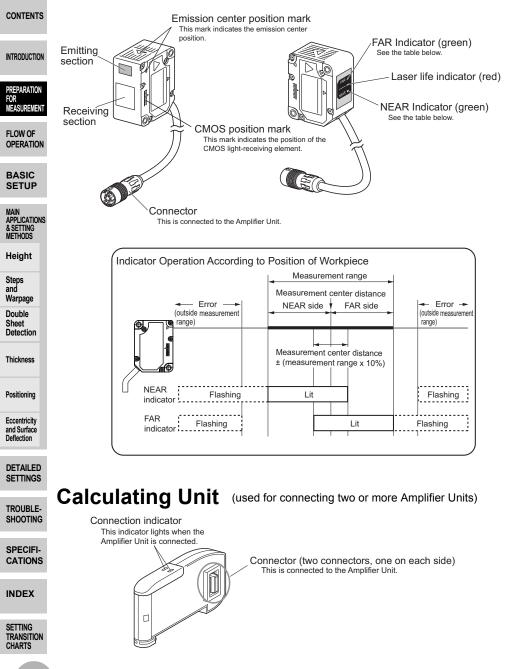
DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Sensor Head



Installation

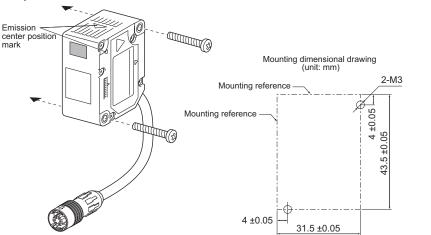
Important

Before connecting/disconnecting Smart Sensor components, make sure that the power to the Amplifier Unit is turned OFF. The Smart Sensor may malfunction if components are connected or removed while the power is ON.

Installing Sensor Heads

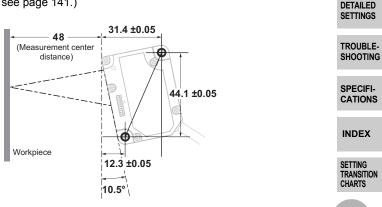
Installation Method

- · Check the Sensor Head setting position by its emission center mark.
- Fix the sensor head in place with M3 screws. The screws must be tightened with a torque of 0.5 N•m.



Tilt the regular-reflective model as shown below with respect to the workpiece.
 A mounting bracket can also be attached to the regular-reflective model to tilt it correctly. (E39-L178; see page 141.)

ZX2-LD50V



CONTENTS

INTRODUCTION

Reparation Or Easurement

FLOW OF

BASIC

SETUP

MAIN APPLICATIONS

Height

Warpage

Double

Sheet Detection

Thickness

Positioning

Eccentricity and Surface

Deflection

23

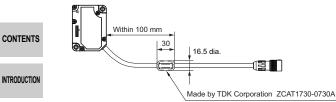
& SETTING

METHODS

Steps and

• Be sure to attach the ferrite core accessory to the Sensor Head. Attach it within 100 mm of the Sensor Head side.

 When mounting a Sensor Head, take care not to touch the emitter and receiver. Finger marks on the emitter and receiver may hinder correct measurements. If you have touched



them by mistake, wipe them with a clean, soft cloth.

· Fix the connectors in places that are not subject to vibration or impact.

Important

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Installing the Amplifier Unit

Amplifier Units can be easily mounted to 35-mm DIN Track.

Hook on the connector end

decrease if the output cable end is hooked on the DIN Track first.

Installation Method

Hook the connector end of the Sensor Head on the DIN Track, and press in at the bottom until the Amplifier Unit locks into place. If necessary, fix it in place by the End Plate.

DIN Track (Option)

PFP-100N (shallow type/1 m) PFP-50N (shallow type/0.5 m)

PFP-100N2 (shallow type/1 m)

End Plate (Option)

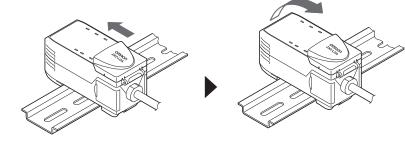
PFP-M

Removal Method

Important

Push the Amplifier Unit and pull out from the connector end of the Sensor Head.

Hook the connector end of the Sensor Head on the DIN Track first. The mounting strength may



MAIN APPLICATIONS & SETTING METHODS

BASIC SETUP

CONTENTS

INTRODUCTION

REPARATION

EASUREMENT

FLOW OF

OPERATION

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

Connecting Calculating Units

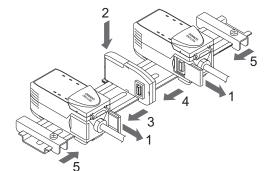
CONTENTS

Use a Calculating Unit to connect Amplifier Units when performing calculations between Amplifier Units and to prevent mutual interference between Sensor Heads.

INTRODUCTION The number of Amplifier Units that can be connected differs depending on the functions to be used.

| PREPARATION For | Function | Number of Connectable Amplifier Units | See: |
|----------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------|
| MEASUREMENT | Calculation | Up to two units (Up to five units can be connected. However, calculations are done between pairs of two.) | (A-B) calculation: |
| FLOW OF OPERATION | | For (A-B) calculations A: CH2 or later | Page 47 Thickness |
| BASIC SETUP | | B: CH1 CH2 CH2 CH2 CH2-CH1 | calculation: Page 57 |
| MAIN APPLICATIONS & SETTING METHODS | | CH4 (CH3-CH1) CH5 (CH4-CH1) (CH5-CH1) | |
| Height | Mutual interference prevention | Up to five units | Page 88 |
| Steps and Warpage | <u>.</u> | 1 | <u> </u> |
| Double Sheet Detection | For details on the cor | nnection method, see the next page. | |
| Thickness | | | |
| Positioning | | | |
| Eccentricity and Surface Deflection | | | |
| DETAILED SETTINGS | | | |
| TROUBLE- SHOOTING | | | |
| SPECIFI- CATIONS | | | |
| INDEX | | | |
| SETTING TRANSITION CHARTS | | | |
| 20 | | | |

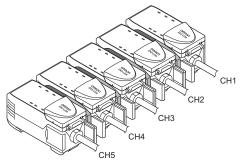
Connection Method



- **1** Open the connector cover on the Amplifier Unit. Open the connector cover by lifting and sliding it.
- **2** Mount the Calculating Unit to the DIN Track.
- **3** Slide and connect the Calculating Unit to the Amplifier Unit connector.
- **4** Slide and connect the second Amplifier Unit to the Calculating Unit connector.
- 5 Fix in place with the End Plate (sold separately: PFP-M).

Important

- To disconnect Amplifier Units and Calculating Units, perform the above operations in reverse order.
- The following diagram shows the channel numbers when multiple Amplifier Units are connected.



CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

Connecting the Sensor Head to the Amplifier Unit

Align the position of the connector \Rightarrow mark with the \blacktriangle mark on the Amplifier Unit, and

CONTENTS

Installation Method

· Extending the Sensor Head cable

Only one extension cable can be used.

An optional extension cable (ZX2-XC□R) must be used.

INTRODUCTION

PREPARATION For MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Important

cable.

Heiaht

Steps and Warpage Double

Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

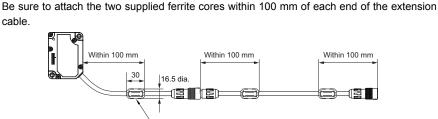
SPECIFI-CATIONS

INDEX

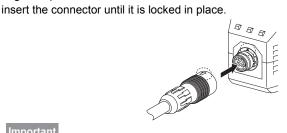
SETTING TRANSITION CHARTS

28



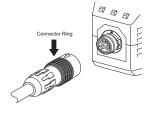


Made by TDK Corporation ZCAT1730-0730A



Removal Method

To disconnect the Sensor Head, hold the Sensor Head's connector ring and the Amplifier Unit connector, and then pull them straight out.



Important

- Do not touch the terminals inside the connector.
- · Prevent the connector from being subjected to static electricity.
- When the Sensor Head is replaced with a different type, set all the setting data inside the Amplifier Unit again since it will be cleared. (default values: → See page 123.)



INTRODUCTION

PREPARATION For Measurement

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Wiring Diagram

CONTENTS

Wiring Input/Output Cables

Wire the cable correctly. Incorrect wiring may damage the Smart Sensor.

The input/output cable has the following wires.

INTRODUCTION

Important

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

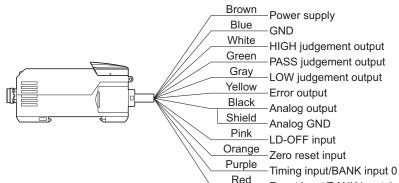
DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-

INDEX

SETTING TRANSITION CHARTS



(For details on the cable's conductor cross-section and insulation resistance, see page 136.)

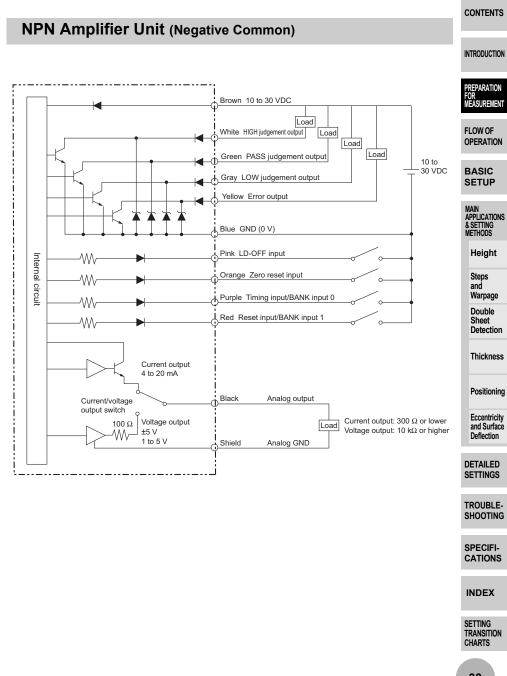
| 6 | Cable color | Name | Function |
|---------------|----------------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| g ty ce | Brown | Power supply | Connects the 10 to 30 VDC (including (p-p) 10% ripple) power supply. When using an Amplifier Unit with a PNP output, the power supply terminal is also the common I/O terminal for all I/O except for the analog output. |
| ED GS | Blue | GND (0 V) | The GND terminal is the 0 V power supply terminal. When using an Amplifier Unit with an NPN output, the power supply terminal is also the common I/O terminal for all I/O except for the analog output. |
| .E- NG | White | HIGH judgement output | The HIGH judgement output outputs judgement results (HIGH). |
| FI- NS | Green | PASS judgment output | The PASS judgement output outputs judgement results (PASS). |
| (| Gray | LOW judgment output | The LOW judgement output outputs judgement results (LOW). |
| ION | Yellow | Error output | This is output when the system detects an error. (For details on error messages, see page 130.) |

ZX2 User's Manual

| Cable color | Name | Function | |
|----------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Black | Analog output | The analog output outputs a current or voltage in accordance with the measured value. (For details on setting method, see page 109.) | CONTENTS |
| Shield | Analog GND (0 V) | The analog GND terminal is the 0 V terminal for the analog output. | INTRODUCTION |
| | | Important Use the shield for analog output separately from the blue (0V) wire for power supply. | PREPARATION FOR MEASUREMENT |
| | | • When analog output is not used, be sure to connect this wire to the blue (0 V) wire. | FLOW OF OPERATION |
| | | When using Calculating Units, make sure that the analog GND lines of the Amplifier Units are connected to each other. | BASIC SETUP |
| Pink | LD-OFF input | If this LD-OFF input signal is ON, the laser will stop emission, causing a light intensity error. In this case, the analog output, digital display, judgement output, and judgement output display signals will be output according to the non-measurement settings. The sub-display will show Ld□FF. Warm up the sensor for at least 10 minutes after canceling LD-OFF input. (For details on the output during non-measurement, | MAIN APPLICATIONS & SETTING METHODS |
| | | | Height |
| | | | and Warpage |
| | | | Double Sheet Detection |
| Orange | Zero reset input | see page 111.) The zero reset input is used to execute and cancel zero reset. | Thickness |
| Orange | | (For details, see page 101.) | Positioning |
| Purple | Timing input/ BANK input 0 (switched by external input setting) | but 0 Signal input wire for obtaining hold function timing. While by this input is being input, the sub-display will show | Eccentricity and Surface Deflection |
| | | | DETAILED SETTINGS |
| | | When connecting two or more Amplifier Units, use the CH1 Amplifier Unit for bank switching. The banks of the Amplifier Units of CH2 and later are switched together | TROUBLE- SHOOTING |
| | | with CH1. (For details on switching and inputs, see page 118.) | SPECIFI- CATIONS |

| | Cable | Name | Function |
|-----------------------------|-------------|--------------------|------------------------------------------------------------------------------------------------|
| | color | | |
| | Red | Reset input/BANK | Reset input: |
| | | input 1 (switched | While a reset signal is being input, RESEL is displayed |
| CONTENTS | | by external input | on the sub-display. |
| | | setting) | When the hold function is not used |
| INTRODUCTION | | | The output while a reset signal is being input is held in |
| INTRODUCTION | | | accordance with the output during non-measurement |
| | | | setting. |
| PREPARATION For | | | This feature can be used in cases such as to input a |
| MEASUREMENT | | | mask signal if you want to stop output for a certain |
| | | | period. |
| FLOW OF OPERATION | | | When the hold function is used If a react signal is input the state in affect before the |
| OF LIVETION | | | If a reset signal is input, the state in effect before the |
| PASIC | | | hold function was set will be restored. (For details on the hold function, see page 93, and |
| BASIC SETUP | | | for details on the output during non-measurement, |
| | | | see page 111.) |
| MAIN APPLICATIONS | | | |
| & SETTING | | | BANK input 1: Signal input wire for bank switching. Banks are switched |
| METHODS | | | by ON/OFF combinations with BANK input 0. |
| Height | | | When connecting two or more Amplifier Units, use the |
| Stone | | | CH1 Amplifier Unit for bank switching. The banks of the |
| Steps and | | | Amplifier Units of CH2 and later are switched together |
| Warpage | | | with CH1. |
| Double Sheet | | | (For details on switching and inputs, see page 118.) |
| Detection | Eor tho tir | ing at which they | a signals are input, see the timing charts on pages 144 |
| | to 146. | ning at which thes | se signals are input, see the timing charts on pages 144 |
| Thickness | 10 140. | | |
| | | | |
| Positioning | | | |
| | | | |
| Eccentricity and Surface | | | |
| Deflection | | | |
| | | | |
| DETAILED | | | |
| SETTINGS | | | |
| | | | |
| TROUBLE- SHOOTING | | | |
| Chooning | | | |
| SPECIFI- | | | |
| CATIONS | | | |
| | | | |
| INDEX | | | |
| | | | |
| OFTINO | | | |
| SETTING TRANSITION | | | |
| CHARTS | | | |

I/O Circuit Diagrams



CONTENTS

INTRODUCTION

PNP Amplifier Unit (Positive Common)

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

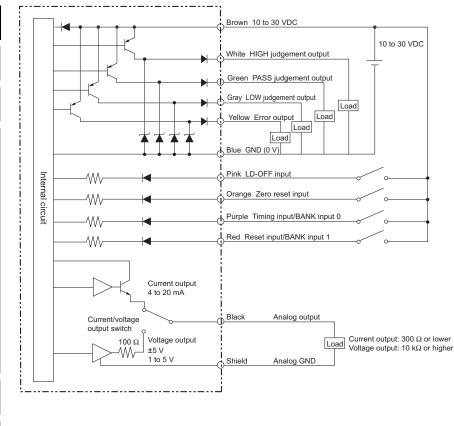
DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

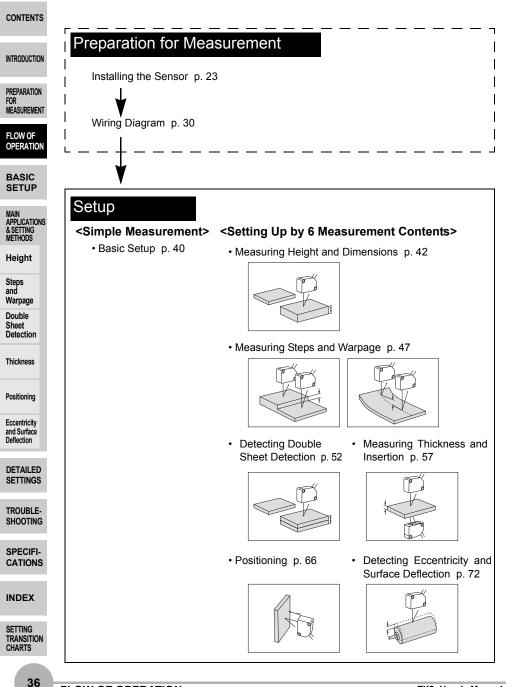
SETTING TRANSITION CHARTS



FLOW OF OPERATION

FLOW OF OPERATION

FLOW OF OPERATION



| Mutual Interference Prevention | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| | | p. 88 | |
| Setting the Hysteresis | | p. 91 | FLOW OF |
| (Improving Unstable Measurement Ne | ar the Judgement Threshold |) | OPERATION |
| Setting Hold (Holding Measured Values) | Under Special Conditions) | p. 93 | |
| Bank Setting | . , | р. 99 | BASIC |
| Zero Reset | | p. 101 | SETUP |
| Scaling (Changing Digital Values for Special | cific Measured Values) | p. 105 | |
| Analog Output | , | p. 109 | MAIN |
| Output for Non-measurement | | p. 111 | APPLICATION: & SETTING |
| (Output Setting During Input of the Re | set Signal at an Error) | P | METHODS |
| • Timer | | p. 114 | Height |
| Setting the Differential Function | | p. 116 | Height |
| External Input for Bank, Timing Input, Re | set Input | p. 118 | Steps |
| Setting the Detection Surface Selection | | p. 110 p. 120 | and |
| (Decreasing Incorrect Measurement Caus | ed by Multireflection on Workn | | Warpage |
| Key Lock Function | sed by Malareneedon on workp | p. 122 | Double |
| Initializing Setting Data | | p. 122 p. 123 | Sheet Detection |
| Setting Data | | p. 123 | Detection |
| <u></u> | | — — ¬ | |
| en an Error Occurs | | I | Positioning |
| — | | i. | |
| Troubleshooting | 100 | I | Fecentricit |
| 0 | p. 128 | 1 | Eccentricity and Surface |
| Error Messages | p. 130 | | |
| • | | | and Surface |
| Error Messages | p. 130 | י | and Surface |
| Error Messages | p. 130 | י | and Surface Deflection |
| Error Messages Q&A | p. 130 | י ו י ר – – ק | and Surface Deflection |
| Error Messages Q&A | p. 130 | ' | and Surface Deflection |
| Error Messages Q&A | p. 130 | | and Surfaci Deflection DETAILED SETTINGS |
| Error Messages Q&A gineering Data etc | p. 130 p. 133 | י | and Surfaci Deflection DETAILED SETTINGS TROUBLE |
| | p. 130 p. 133 | י | and Surfaci Deflection DETAILED SETTINGS TROUBLE- SHOOTING |
| Error Messages Q&A Qanter of the second secon | p. 130 p. 133 | | and Surfac Deflection DETAILED SETTINGS TROUBLE SHOOTING SPECIFI- |
| Error Messages Q&A Qanter of the second secon | p. 130 p. 133 | | and Surfac Deflection DETAILED SETTINGS TROUBLE SHOOTING SPECIFI- |
| Error Messages Q&A Qanger A Gineering Data etc Function Transition Charts Specifications and Dimensions | p. 130 p. 133 | | and Surfac Deflection DETAILED SETTINGS TROUBLE: SHOOTING SPECIFI- |
| Error Messages Q&A Qata etc Gineering Data etc Function Transition Charts Specifications and Dimensions Timing Charts Engineering Data (Reference Value) | p. 130 p. 133 | | and Surfaci Deflection DETAILED SETTINGS TROUBLE- SHOOTING |
| Error Messages Q&A Qange | p. 130 p. 133 | ' | and Surfaci Deflection DETAILED SETTINGS TROUBLE- SHOOTING SPECIFI- CATIONS |
| Error Messages Q&A Q&A Gineering Data etc Function Transition Charts Specifications and Dimensions Timing Charts Engineering Data (Reference Value) | p. 130 p. 133 | | and Surfaci Deflection DETAILED SETTINGS TROUBLES SHOOTING SPECIFI- CATIONS INDEX |
| Error Messages Q&A Q&A Gineering Data etc Function Transition Charts Specifications and Dimensions Timing Charts Engineering Data (Reference Value) | p. 130 p. 133 | | and Surfac Deflection DETAILED SETTINGS TROUBLE SHOOTIN SPECIFI- CATIONS |

Detailed Settings

Selecting the Initial Sub-Display

Connecting Two or More Amplifier Units

• Smart Tuning (Optimizing the Sensing Conditions)

ZX2 User's Manual

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

p. 80

p. 84

p. 86

CONTENTS

INTRODUCTION

PREPARATION For Measurement

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Dettection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

BASIC SETUP

BASIC SETUP

BASIC SETUP

Display of RUN Mode CONTENTS







FLOW OF OPERATION



MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage Double

Sheet Detection

Thickness

Pos

Ecc and Def

DE SE

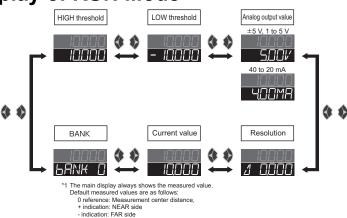
TR

SH

SF CA

IN

SE TR/ CHARTS



For how to select the initial sub-display to be displayed when the power is turned on, see page 84.

The numerals shown in the above diagram are an example only. The actual display may be different.

Simplest Setting

Smart Tuning (Single Smart Tuning)

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

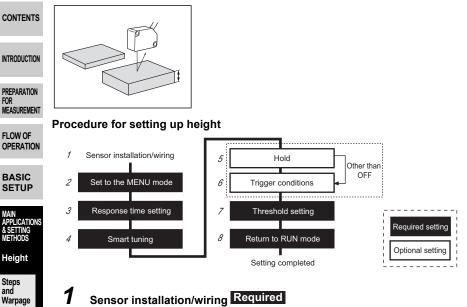
| lickings | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| extensioning extension of the second | | _ | Set the reference workpiece in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that the distance between the Sensor Head and the workpiece is the measurement center distance, and install the Sensor Head at this position. | |
| HOOTING PECIFI- ATIONS NDEX | Hold down for 1 second | Pressing down | Press the button for one second. When SMARL/ SI NGLE is displayed, release your finger from the button to start execution of smart tuning. | If "FREE" flashes on the sub-display for three seconds, it indicates that tuning was not possible. Change the response time setting to a larger value, and itry again. |
| RANSITION | | riastility | | |

To tune multiple workpieces or to tune workpieces having a different surface condition: page 80

MAIN APPLICATIONS & SETTING METHODS

| Height | 42 |
|-------------------------------------|----|
| Steps and Warpage | 47 |
| Double Sheet Detection | 52 |
| Thickness | 57 |
| Positioning | 66 |
| Eccentricity and Surface Deflection | 72 |

Height



Has the Sensor been installed and wired? (See page 23.)

Set the reference workpiece in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that the height to be measured is near the measurement center distance, and install the Sensor Head at this position.

Set to the MENU mode Required ∕

Select the desired mode to set the measurement conditions in.

| and Surface | | | | |
|---------------------------------|----------------------------|-----------------|--------------------------------------------------------------------------------|---------------------------------------------------|
| Deflection | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| DETAILED SETTINGS | SMART MENU/SET | | Hold down the button for three seconds to switch to the | |
| TROUBLE- SHOOTING | Hold down for 3 seconds | | MENU mode. | |
| 300011110 | Press | dEERI L | Press the 🏶 button to display | * This operation is not required when hold and |
| SPECIFI- CATIONS | res to display. | | | trigger conditions are not to be set. |
| INDEX | | Idelai L Din | Press the ♥ button to set the display to □N to set display of the detail menu. | |
| SETTING TRANSITION CHARTS | Press to display. | | | |

Double

Sheet Detection

Thickness

Positioning

Eccentricity and Sur

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|---------------------|---------|----------------------------------------|-------------------------------|----------|
| SMART MENU/SET | | Press the button to apply the setting. | | CONTENTS |

3 Response time setting Required

Select the response time to match the size and moving speed of the sensing object.

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | PREPARATION For |
|---------------------|----------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Press to display; | 58553 888888 | Press the \$ button to display SPEEd. | Default value: 500 ms | MEASUREMENT FLOW OF OPERATION |
| Press to select | SPEEd IM5 Select the desired value. | Press the 💲 button to select the response time. | Select the response time to match the size and moving speed of the sensing object. $\begin{array}{c} \hline 60 \ \mu\text{s}, 120 \ \mu\text{s}, 240 \ \mu\text{s}, 500 \ \mu\text{s}, \\ 1 \ m\text{s}, 2 \ m\text{s}, 4 \ m\text{s}, 8 \ m\text{s}, 12 \ m\text{s}, \\ 20 \ m\text{s}, 36 \ m\text{s}, 66 \ m\text{s}, 128 \ m\text{s}, \\ 250 \ m\text{s}, 500 \ m\text{s} \end{array}$ | BASIC SETUP MAIN APPLICATIONS & SETTING METHODS Height Steps |
| SMART MENU/SET | | Press the button to apply the setting. | * After the response time is changed, the smart tuning results are cleared, so be sure to re-execute tuning. | and Warpage Double Sheet Detection |

4 Smart tuning Required

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Eccentricity and Surface Deflection |
|---------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------|
| _ | _ | Check that the reference workpiece is set in place. | | DETAILED SETTINGS |
| SMART MENU/SET Hold down for 1 second | down for second. When SMARL/ | Press the button for one second. When SMARL/ SI NGLE is displayed, release | If " FRILED " flashes on the Isub-display for three seconds, it indicates that | TROUBLE- SHOOTING |
| | your finger from the button to | tuning was not possible. Change the response time Isetting to a larger value, and | SPECIFI- CATIONS | |
| | SI NULE | | try again. | |
| | Flashing | | | INDEX |

* To tune multiple workpieces or to tune workpieces having a different surface condition: page 80

SETTING TRANSITION CHARTS

Thickness

Positioning

INTRODUCTION

5 Hold Optional

Set this item to hold measured values during the measurement period according to preset hold conditions.

| | • | | | |
|-----------------------------------------------------------|---------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| INTRODUCTION | Press to display. | <u> </u> | Press the ♦ button to display H□Ld. | Default value: OFF |
| PREPARATION FOR MEASUREMENT FLOW OF OPERATION | Press to select | PERK Select the | Press the 💲 button to select the hold conditions. | Hold OFF RIFE The average measured value |
| BASIC SETUP | | desired value. | | during the sampling period is held. PEP The difference between the minimum and maximum |
| MAIN APPLICATIONS & SETTING METHODS | | | | values during the sampling period is held. |
| Height Steps and Warpage | | | | The measured value at the start of the sampling period is held. |
| Double Sheet Detection | | | | The minimum value during the sampling period is held. |
| Thickness | | | | the sampling period is held. (For details, see page 95.) |
| Positioning Eccentricity and Surface | SMART MENU/SET | | Press the button to apply the setting. | * The clamp value is output until the first sampling period is finished. |
| Deflection DETAILED SETTINGS | | | When other thanFF is selected, proceed to "6 Trigger conditions," and whenFF is selected, proceed to "7 Threshold | (For details on the clamp value, see page 111.) |
| TROUBLE- SHOOTING | | | setting." | of the hold measurement |
| SPECIFI- CATIONS | | er conditions [| Optional period is to be | input. |
| INDEX | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| SETTING TRANSITION CHARTS | Press to display. | <u> </u> | Press the ♦ button to display ERI []. | Default value: TIMING |
| | | | | · |

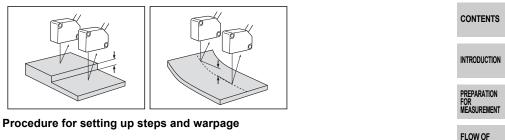
| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|------------------------|---------------------------|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| | <u>ERIG</u> EIMING | Press the 💲 button to select the trigger conditions. | Enter the trigger by using the timing input or by pressing | CONTENTS |
| Press to select | Select the desired value. | | the Sutton in the RUN mode. The period that the timing signal is ON is the sampling period. | INTRODUCTION |
| | | | SELF-d The sampling period is the | PREPARATION FOR MEASUREMENT |
| | | | period that the measured value is lower than the specified self-trigger level. | FLOW OF OPERATION |
| | | | SELF-U The sampling period is the period that the measured | BASIC SETUP |
| | | | value is greater than the specified self-trigger level. (For details, see page 97.) | MAIN APPLICATIONS & SETTING METHODS |
| SMART MENU/SET | | Press the button to apply the trigger conditions. | | Height |
| | | When SELF-U and | | Steps and Warpage |
| | | SELF-d are selected, proceed to the next item, and | | Double Sheet Detection |
| | | when <code>LI MI N_</code> is selected, proceed to "7 Threshold setting." | | Thickness |
| Pressto | SELF <u>L</u> V | Press the ♦ button to display SELFLI∕ | Default value: 0.000 | Positioning |
| display. | | | | Eccentricity and Surface Deflection |
| | | Press the sutton to enable setting of the self-trigger level. | | DETAILED SETTINGS |
| [Change numeric value] | <u>SELFL/</u> | Press the 🔹 button to move the digit, press the 💲 button to | * If the \$ button is pressed when the cursor is at the | TROUBLE- SHOOTING |
| Press to set. | Set any value. | change the numeric value, and set the self-trigger level. | right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled. | SPECIFI- CATIONS |
| SMART MENU/SET | | Press the button to apply the setting. | | INDEX |
| | <u> </u> | | 1 | SETTING TRANSITION CHARTS |

7 Threshold setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

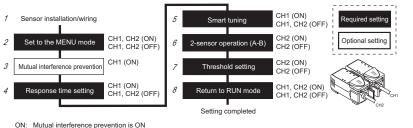
| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|----------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| INTRODUCTION | Press to display | Lit H L MENU | Press the 🌒 button to display the HIGH threshold. | Setting example: Non-defective product height 0 to 10 mm |
| Preparation For Measurement | | | Press the 🏶 button to enable setting of the HIGH threshold. | H NG OK NG P L 0 |
| FLOW OF OPERATION | | | | Set the MAX and MIN heights to be regarded as OK |
| BASIC SETUP | [Change numeric value] | Set any value. | Press the (() button to move the digit, press the () button to change the numeric value, and set the HIGH threshold. | to the HIGH and LOW thresholds, respectively. * If the to button is pressed |
| MAIN APPLICATIONS & SETTING METHODS | SMART MENU/SET | | Press the button to apply the setting. | when the cursor is at the right-most digit or the \$ button is pressed when the |
| Height Steps and Warpage | Press to display, | Lit H L MENU | Press the 🌒 button to display the LOW threshold. | cursor is at the left-most digit, the setting will be canceled. |
| Double Sheet Detection | | | Press the Sutton to enable setting of the LOW threshold. | threshold is greater than the LOW threshold. |
| Positioning | [Change numeric value] | CODO Set any value. | Press the () button to move the digit, press the () button to change the numeric value, and set the LOW threshold. | |
| and Surface Deflection | SMART MENU/SET | | Press the button to apply the setting. | |
| SETTINGS | 8 Retur | n to RUN mod | e Required Switch to the second secon | ne mode in which measurement |
| SHOOTING | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| | SMART MENU/SET Hold down for 3 seconds | Out H L MENU | Hold down the button for three seconds to switch to the RUN mode. | |
| SETTING TRANSITION CHARTS | | | settings, such as output and inp erence height to 0 (or the offset | |

Steps and Warpage



The Amplifier Units to set up differ depending on whether mutual interference prevention is set to ON or OFF.

Note that different channels are used to specify each menu item, as shown below.



OFF: Mutual interference prevention is ON

Sensor installation/wiring Required

Has the Sensor been installed and wired? (See page 23.)

Connect two Amplifier Units with a Calculating Unit in between. (The calculation result is displayed and output on the CH2 Amplifier Unit.)

Set the reference workpiece in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that each of the heights to be measured is near the measurement center distance, and install the Sensor Head at this position.

2 Set to the MENU mode Required

Select the desired mode to set the measurement conditions in.

(Use CH1 and CH2 for these settings.)

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | INDEX |
|----------------------------------------------|----------|--------------------------------------------------------------------------|----------------------------------|---------------------------------|
| SMART MENU/SET Hold down for 3 seconds | H L MENU | Hold down the button for three seconds to switch to the MENU mode. | | SETTING TRANSITION CHARTS |

OPERATION

BASIC SETUP

MAIN APPLICATIONS

& SETTING

METHODS

Steps and

Warpage

Double

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED

SETTINGS

TROUBLE-SHOOTING

SPECIFI-

CATIONS

Sheet Detection

Heiaht

| | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|---------------------|-------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| CONTENTS | Press to display. | dELRI L 888888 | Press the I button to display dELRI L. | |
| INTRODUCTION | | delai L DN | Press the ♣ button to set the display to □N to set display of the detail menu. | |
| PREPARATION FOR MEASUREMENT | Press to display. | | | |
| FLOW OF OPERATION | SMART MENU/SET | | Press the button to apply the setting. | |
| BASIC SETUP | | al interference | prevention Optional interference | m to prevent the influence of mutual ce between two Sensor Heads. |
| MAIN APPLICATIONS & SETTING METHODS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| Height | Press to | <u> </u> | Press the 🏶 button on the CH1 Amplifier Unit to display 54NE. | Default value: OFF |
| Steps and Warpage | | | | |
| Double Sheet Detection | | <u> </u> | Press the ♥ button to display □N. | |
| Thickness | Press to display. | | Press the 👅 button to apply | * For datails on the reasons |
| Positioning | SMART MENU/SET | | the setting. | * For details on the response time when connecting two or more Amplifier Units, see page 86. |
| and Surface Deflection | | | | <u> </u> |
| DETAILED SETTINGS | <u> </u> | onse time setti | ing Required and moving | esponse time to match the size speed of the sensing object. |
| TROUBLE- | | | prevention is set to OFF: Use CH | v |
| SHOOTING | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| SPECIFI- CATIONS | Press to displ | SPEEd | Press the 🌢 button to display | Default value: 500 ms |
| INDEX | display. | 000000 | | |
| SETTING TRANSITION CHARTS | | | | |
| | | | | |

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | | | |
|---------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------------------------------------------|------------------------------|
| | IMS | Press the 💲 button to select the response time. | Select the response time to match the size and moving speed of the sensing object. | CONTENTS | | |
| Press to select | Select the desired value. | | 60 μs, 120 μs, 240 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms, | INTRODUCTION | | |
| SMART MENU/SET | | Press the button to apply the setting. | 250 ms, 500 ms * After the response time is changed, the smart tuning | PREPARATION FOR MEASUREMENT | | |
| | | the setting. | results are cleared, so be sure to re-execute tuning. | FLOW OF OPERATION | | |
| 5 Smart | t tuning Requ | ired according to the | s optimum sensing conditions operating conditions nd color/state of workpiece) | BASIC SETUP | | |
| | | prevention is ON: Use CH prevention is set to OFF: Use CH | 11 for these settings. 11 and CH2 for these settings. | MAIN APPLICATIONS & SETTING METHODS | | |
| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Height | | |
| _ | _ | Check that the reference workpiece is set in place. | | Steps and Warpage | | |
| SMART MENU/SET Hold down for 1 second | Pressing down SMRRL SINGLE Pressed down LUNING SINGLE | Pressing down | сморі | | If "FRILED" flashes on the sub-display for three seconds, it indicates that | Double Sheet Detection |
| | | SI NGLE is displayed, release your finger from the button to start execution of smart tuning. | tuning was not possible. Change the response time Isetting to a larger value, and try again. * If mutual interference | Thickness | | |
| | | | | Positioning | | |
| | Flashing | | prevention is set to ON, after smart tuning execution for | Eccentricity and Surface Deflection | | |
| | | | CH1 ends, it is also executed for the Amplifier Units of CH2 and later. If the tuning result | DETAILED SETTINGS | | |
| | | | is NG for either Amplifier Unit, the smart tuning setup results are not applied to any | TROUBLE- SHOOTING | | |
| | | | amplifier units. | SPECIFI- | | |

* To tune multiple workpieces or to tune workpieces having a different surface CATIONS condition: page 80

INDEX

6 2-sensor operation (A-B) Required

Set this item when calculating the difference between the measurement results from two Sensor Heads. The measurement result for CH1 is substracted from the measurement result of the channel being set.

CONTENTS (Use CH2 for these settings.)

| INTRODUCTION | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|---------------------|--------------------|-------------------------------------------------------------------|----------------------------------------------------------------------|
| PREPARATION FOR MEASUREMENT | Press to display. | <u></u> 888888 | Press the to button on the CH2 Amplifier Unit to display [RL[. | Calculating Unit CH1 |
| FLOW OF OPERATION | | | | |
| BASIC SETUP | | | | CH2 (Calculation result is output.) |
| MAIN APPLICATIONS & SETTING METHODS | Press to select | <u>ERLE</u> R-b | Press the ┋ button to display 用−占. | |
| Height | SMART MENU/SET | | Press the button to apply | * For details on the response |
| Steps and Warpage | | | the setting. | time when connecting two or more Amplifier Units, see page 86. |
| Double Sheet Detection | | | | page oo. |

Thickness

7 Threshold setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

(Use CH2 for these settings.)

| Positioning | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|---------------------------|---------------------|-----------------|--------------------------------------------------|---------------------------------------------------------|
| Eccentricity | Operation | | | Selection Menu |
| and Surface Deflection | Pre | | Press the \$ button on the CH2 | Setting example: |
| DETAILED SETTINGS | ss to display. | Lit H L MENU | Amplifier Unit to display the HIGH threshold. | Non-defective product step 3 to 8 mm |
| | | | | □ ^{NG} _OK NG |
| TROUBLE- SHOOTING | | | | |
| SPECIFI- CATIONS | | | | P |
| | | | | Set the MAX and MIN steps |
| INDEX | | | | to be regarded as OK to the HIGH and LOW thresholds, |
| OFTTINO | | | | respectively. |
| SETTING TRANSITION | | | | <u> </u> |

SETTING TRANSITI CHARTS

50

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|------------------------|-----------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| | | Press the Soutton to enable setting of the HIGH threshold. | * If the \$ button is pressed when the cursor is at the right-most digit or the \$ button is pressed when the | CONTENTS |
| [Change numeric value] | 12.345 8000 | Press the ** button to move the digit, press the \$ button to change the numeric value, and | cursor is at the left-most digit, the setting will be canceled. | INTRODUCTION |
| Press to set. | Set any value. | set the HIGH threshold. | * Set so that the HIGH threshold is greater than the | PREPARATION FOR MEASUREMENT |
| SMART MENU/SET | | Press the button to apply the setting. | LOW threshold. | FLOW OF |
| Press to display. | H L MENU | Press the 🌒 button to display the LOW threshold. | | BASIC SETUP |
| | | Press the 🏶 button to enable setting of the LOW threshold. | | MAIN APPLICATIONS & SETTING METHODS Height |
| [Change numeric value] | 12.345 3000E | Press the (**) button to move the digit, press the (*) button to change the numeric value, and | | Steps and Warpage |
| Press to set. | Set any value. | set the LOW threshold. Press the 👅 button to apply | - | Double Sheet Detection |
| SMART MENU/SET | | the setting. | | Thickness |

8 Return to RUN mode Required

Switch to the mode in which measurement is performed.

(Use CH1 and CH2 for these settings.)

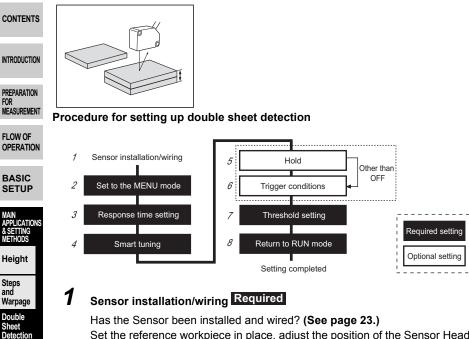
| Button | Diamlay | Description of Operation | Explanation of | Defiection |
|----------------------------|---------|------------------------------------------|----------------|----------------------|
| Operation | Display | Description of Operation | Selection Menu | DETAILED |
| SMART MENU/SET | Out | Hold down the 🖱 button for | | SETTINGS |
| Hold down for 3 seconds | | three seconds to switch to the RUN mode. | | TROUBLE- SHOOTING |

* For details on optimizing settings, such as output and input, see "DETAILED SETTINGS."

Positioning

Eccentricity and Surface

Double Sheet Detection



Set the reference workpiece in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that the measured value at measurement of one product and at measurement of two products is within the measurement range, and install the Sensor Head at this position.

Set to the MENU mode Required

Select the desired mode to set the measurement conditions in.

| and Surface | | | | | |
|---------------------------------|----------------------------|--------------------------|---------------------------------------------------------------|--------------------------------------------------------------------|--|
| Deflection | Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
| DETAILED SETTINGS | SMART MENU/SET | Lit | Hold down the button for three seconds to switch to the | | |
| TROUBLE- SHOOTING | Hold down for 3 seconds | H L MENU | MENU mode. | | |
| | | | Press the 🕴 button to display | * This operation is not | |
| SPECIFI- CATIONS | Press to display. | <u>dELAI L</u> 888888 | dELAI L. | required when hold and trigger conditions are not to be set. | |
| INDEX | | dELRI L | Press the 拳 button to set the display to □N to set display of | | |
| SETTING TRANSITION CHARTS | Press to display. | BN | the detail menu. | | |

Thickness

Positioning

Eccentricity and

52

/

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|---------------------|---------|----------------------------------------|----------------------------------|----------|
| SMART MENU/SET | | Press the button to apply the setting. | | CONTENTS |

3 Response time setting Required

Select the response time to match the size and moving speed of the sensing object.

| INTRODUCTION | |
|--------------|--|
| | |
| | |

Positioning

| | Button Operation | Display | Description of Operation | Explanation of Selection Menu | PREPARATION FOR MEASUREMENT |
|---|---------------------|---------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| | Press to display, | <u> </u> | Press the \$ button to display SPEEd. | Default value: 500 ms | FLOW OF OPERATION |
| - | | | Press the 💲 button to select the | Select the response time to | BASIC SETUP |
| | Press to select | | response time. | match the size and moving speed of the sensing object. | MAIN APPLICATIONS & SETTING |
| | F 1055 IO SEIECI | Select the desired value. | | 60 μs, 120 μs, 240 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms, | MaiHods Height |
| - | CALADY MENUICES | | | 250 ms, 500 ms | Steps and Warpage |
| | SMART MENU/SET | | Press the 👅 button to apply the setting. | * After the response time is changed, the smart tuning results are cleared, so be sure to re-execute tuning. | Double Sheet Detection |
| - | | | | | Thickness |

4 Smart tuning Required

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Eccentricity and Surface Deflection |
|---------------------------------------------|---------------------|-----------------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------------|
| _ | | Check that the reference workpiece is set in place. | | DETAILED SETTINGS |
| SMART MENU/SET Hold down for 1 second | | second When SMUUL | If " FRILED" flashes on the sub-display for three seconds, it indicates that | TROUBLE- SHOOTING |
| | Pressed down | Pressed down your finger from the button to | tuning was not possible. Change the response time setting to a larger value, and | SPECIFI- CATIONS |
| | SI NGLE Flashing | | try again. | INDEX |

* To tune multiple workpieces or to tune workpieces having a different surface SETTING TRANSITION CHARTS

5 Hold Optional

Set this item to hold measured values during the measurement period according to preset hold conditions.

| | • | | | |
|----------------------------------------------|---------------------|---------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| INTRODUCTION | Press to display. | H0Ld 888888 | Press the ♦ button to display H□L⊣. | Default value: OFF |
| PREPARATION For Measurement | | HOLJ PE8k | Press the 💲 button to select the hold conditions. | DFF Hold OFF R⊮E |
| FLOW OF OPERATION | Press to select | Select the desired value. | | The average measured value during the sampling period is held. |
| BASIC SETUP | | | | PEDP The difference between the minimum and maximum |
| MAIN APPLICATIONS & SETTING METHODS | | | | values during the sampling period is held. |
| Height | | | | The measured value at the start of the sampling period is |
| Steps and Warpage | | | | held. held. held. The minimum value during |
| Double Sheet Detection | | | | the sampling period is held. |
| Thickness | | | | the sampling period is held. (For details, see page 95.) |
| Positioning | SMART MENU/SET | | Press the button to apply the setting. | * The clamp value is output until the first sampling period |
| Eccentricity and Surface Deflection | | | When other than <a>DFF is selected, proceed to "6 | is finished. (For details on the clamp value, see page 111.) |
| DETAILED SETTINGS | | | Trigger conditions," and when <i>DFF</i> is selected, proceed to "7 Threshold setting." | |
| TROUBLE- SHOOTING | | | Set how timi | ng of the hold measurement |
| SPECIFI- CATIONS | | er conditions [| Optional period is to b | pe input. |
| INDEX | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| SETTING TRANSITION CHARTS | Press to display. | <u> </u> | Press the ು button to display 上RI ☐. | Default value: TIMING |
| | | 1 | | |

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|------------------------|---------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| | ERIG EI MI NG | Press the 💲 button to select the trigger conditions. | Enter the trigger by using the timing input or by pressing the the button in the RUN | CONTENTS |
| Press to select | Select the desired value. | | mode. The period that the timing signal is ON is the | INTRODUCTION |
| | | | sampling period. SELF-d The sampling period is the | PREPARATION FOR MEASUREMENT |
| | | | period that the measured value is lower than the specified self-trigger level. | FLOW OF OPERATION |
| | | | SELF-U The sampling period is the period that the measured | BASIC SETUP |
| | | | value is greater than the specified self-trigger level. (For details, see page 97.) | MAIN APPLICATIONS & SETTING METHODS |
| SMART MENU/SET | | Press the button to apply the trigger conditions. | | Height |
| | | When SELF-U and | | Steps and Warpage |
| | | SELF - d are selected, proceed to the next item, and when ∠I MI N_ is selected, | | Double Sheet Detection |
| | | proceed to "7 Threshold setting." | | Thickness |
| Press to d | <u>SELFLI/</u> | Press the ♦ button to display SELFLV | Default value: 0.000 | Positioning |
| isplay. | | | | Eccentricity and Surface Deflection |
| | | Press the sutton to enable setting of the self-trigger level. | | DETAILED SETTINGS |
| [Change numeric value] | <u>561.617</u> 99999 | Press the \$\$ button to move the digit, press the \$ button to | * If the \$ button is pressed when the cursor is at the | TROUBLE- SHOOTING |
| Press to set. | Set any value. | change the numeric value, and set the self-trigger level. | right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled. | SPECIFI- CATIONS |
| SMART MENU/SET | | Press the button to apply the setting. | | INDEX |
| | | the county. | | SETTING TRANSITION CHARTS |

7 Threshold Setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| INTRODUCTION | Press to display | Lit H L MENU | Press the 🌒 button to display the HIGH threshold. | Examples: |
| FOR MEASUREMENT FLOW OF OPERATION | | | Press the Sutton to enable setting of the HIGH threshold. | Set the HIGH and LOW thresholds right in the middle of the measured values of sheets 1 and 2 and sheets 1 |
| BASIC SETUP | [Change numeric value] | A Set any value. | Press the (**) button to move the digit, press the (**) button to change the numeric value, and set the HIGH threshold. | and 0, respectively. * If the \$ button is pressed when the cursor is at the right-most digit or the \$ |
| MAIN APPLICATIONS & SETTING METHODS | SMART MENU/SET | | Press the button to apply the setting. | button is pressed when the cursor is at the left-most digit, |
| Height Steps and Warpage | Press to display. | H L MENU | Press the \$ button to display the LOW threshold. | the setting will be canceled. * Set so that the HIGH threshold is greater than the LOW threshold. |
| Double Sheet Detection Thickness | | | Press the 🏶 button to enable setting of the LOW threshold. | LOW theshold. |
| Positioning | [Change numeric value] | – 0,500 Set any value. | Press the ** button to move the digit, press the \$ button to change the numeric value, and set the LOW threshold. | |
| and Surface Deflection | SMART MENU/SET | | Press the button to apply the setting. | |
| SETTINGS | 8 Retur | n to RUN mod | e Required Switch to the is performed. | mode in which measurement |
| SHOOTING | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| CATIONS | SMART MENU/SET | Out | Hold down the button for | |

INDEX

SETTING TRANSITION CHARTS

56

*

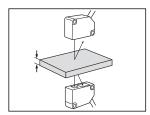
For details on optimizing settings, such as output and input, see "Detailed Settings." Example (Setting the reference height to 0 (or the offset value): **Zero Reset** \rightarrow **page 101**)

three seconds to switch to the

RUN mode.

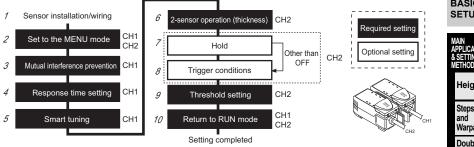
Hold down for 3 seconds T T

Thickness



Procedure for setting up thickness

The Amplifier Units to set up differ for each menu. Note also that different channels are used to specify each menu item, as shown below.



Sensor installation/wiring Required

Has the Sensor been installed and wired? (See page 23.)

Connect two Amplifier Units with a Calculating Unit in between. (The calculation result is displayed and output on the CH2 Amplifier Unit.)

Set up the two Sensor Heads so that they are facing each other, adjust the positions of the Sensor Heads while looking at the digital display values on the Amplifier Units or the indicators on the Sensor Heads so that the clearance between the sensing object and each Sensor Head is near the measurement center distance, and install the Sensor Heads at these positions.

Prepare a reference sensing object of known thickness.

2 Set to the MENU mode Required

Select the desired mode to set the measurement conditions in.

(Use CH1 and CH2 for these settings.)

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | INDEX |
|---------------------|-----------------|--------------------------------------------------------------------|----------------------------------|---------------------------------|
| SMART MENU/SET | Lit H L MENU | Hold down the button for three seconds to switch to the MENU mode. | | SETTING TRANSITION CHARTS |

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

APPLICATIONS & SETTING METHODS

Heiaht

and Warpage Double

Sheet

Detection Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

| | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|---------------------|------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| CONTENTS | Press to display. | dELRI L 888888 | Press the I button to display dELRI L. | |
| INTRODUCTION | | dEERI L | Press the 拳 button to set the display to □N to set display of | |
| PREPARATION For Measurement | Press to display. | ON | the detail menu. | |
| FLOW OF OPERATION | SMART MENU/SET | | Press the button to apply the setting. | |
| BASIC SETUP | | al interference | prevention Required interferen | tem to prevent the influence of mutual ice between two Sensor Heads. |
| MAIN APPLICATIONS & SETTING METHODS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| Height | Press to | <u> </u> | Press the 🏘 button on the CH1 Amplifier Unit to display 54NE. | Default value: OFF |
| Steps and Warpage | display, | | | |
| Double Sheet Detection | | <u>Sync</u> On | Press the ✤ button to display □N. | |
| Thickness Positioning | SMART MENU/SET | | Press the button to apply the mutual interference prevention setting. | * For details on the response time when connecting two or more Amplifier Units, see page 86. |
| Eccentricity and Surface Deflection | 4 Resp | onse time setti | ng Required Select the re | sponse time to match the size speed of the sensing object. |
| DETAILED SETTINGS | | CH1 for these s | - | |
| TROUBLE- SHOOTING | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| SPECIFI- CATIONS | Press to display. | <u>SPEEd</u> 888888 | Press the s button on the CH1 Amplifier Unit to display SPEEd. | Default value: 500 ms |
| INDEX | | | | |
| SETTING TRANSITION CHARTS | | | | |
| 58 | Thickness | | | ZX2 User's Manual |

| | Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|--|---------------------|----------------|----------------------------------|----------------------------------------------------------------|----------------------|
| | | | Press the 💲 button to select the | Select the response time to | |
| | | IMS | response time. | match the size and moving speed of the sensing object. | CONTENTS |
| | Press to select | Select the | | 60 μs, 120 μs, 240 μs, 500 μs, | |
| | desired value. | desired value. | | 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms, | INTRODUCTION |
| | | | 250 ms, 500 ms | PREPARATION | |
| | SMART MENU/SET | | Press the 🖱 button to apply | * After the response time is | FOR MEASUREMENT |
| | | | the setting. | changed, the smart tuning results are cleared, so be | |
| | | | | sure to re-execute tuning. | FLOW OF OPERATION |

5 Smart tuning Required

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

(Use CH1 for these settings.)

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | MAIN APPLICATIONS & SETTING METHODS |
|---------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| _ | _ | Check that the reference workpiece is set in place. | | Height Steps |
| Hold down for | Pressing down | Press the button on the CH1 Amplifier Unit for one second. When SMRRE/SI NGLE is displayed, release your finger from the button to start execution of smart tuning. | If " File Control of the sub-display for three seconds, it indicates that tuning was not possible. Change the response time setting to a larger value, and try again. * After smart tuning execution for CH1 ends, it is also executed for the Amplifier Units of CH2 and later. If the tuning result is NG for either Amplifier Unit, the smart tuning setup results are not applied to any amplifier units. | Double Sheet Detection Thickness Positioning Eccentricity and Surface Deflection DETAILED SETTINGS TROUBLE- SHOOTING |

* To tune multiple workpieces or to tune workpieces having a different surface condition: page 80

SPECIFI-CATIONS

BASIC

SETUP

MAIN

INDEX

SETTING TRANSITION CHARTS

Make this initial setting to measure thickness when using two Sensor Head to measure thickness.

6 2-sensor operation (thickness) Required

(Use CH2 for these settings.)

| | , | | o , | |
|------------------------------------------------|------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| INTRODUCTION | | | Set the reference sensing object of which thickness is known in place. | Calculating Unit |
| Preparation For Measurement | — | — | | CHI |
| FLOW OF OPERATION | | | | (Calculation result is output.) |
| BASIC SETUP | Press to display. | 888888 | Press the the button on the CH2 Amplifier Unit to display [RL[. | |
| APPLICATIONS & SETTING METHODS Height | Press to select | EALC EXICX | Press the 💲 button to display 上HI [K. | |
| Steps and Warpage | SMART MENU/SET | | Press the button to apply the thickness setting. | |
| Double Sheet Detection Thickness | [Change numeric value] | Set any value. | Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the thickness numeric value. | * If the \$ button is pressed when the cursor is at the right-most digit or the \$ button is pressed when the cursor is at the left-most digit, |
| Positioning | | | New St. | the setting will be canceled. |
| Eccentricity and Surface Deflection | SMART MENU/SET | | Press the button to apply the setting. | * The 2-sensor operation reference value is determined based on the measured values of CH1 and CH2 by the timing |
| DETAILED SETTINGS | | | | that setting of the thickness numeric values is executed. * For details on the response |
| TROUBLE- SHOOTING | | | | time when connecting two or more Amplifier Units, see page 86. |
| SPECIFI- CATIONS | | 1 | 1 | 1 |
| INDEX | | | | |
| SETTING | | | | |

SETTING TRANSITION CHARTS Important

- If analog output is to be used, the entered thickness value is used as the center value of the analog output range. (For example, 0 V is used if the analog output is ±5 V.)
- After thickness calculation, the maximum and minimum measurement range values (CH2 measurement values) are assigned as the maximum and minimum analog output range.
- Concerning the minimum and maximum analog output values, the analog output minimum value is output for the smaller of the post-thickness calculation values, and the analog output maximum value is output for the larger of these values.

Example: If the ZX2-LD50 is used, a thickness value of 20 mm is entered, and analog output from –5 to 5 V is specified.

| | Measured Value After Thickness Calculation | How the Measurement Value Is Calculated | Analog Output | FLOW |
|---|-----------------------------------------------|------------------------------------------------------------------|------------------|-----------------------|
| | 10.000 | Thickness value – (CH2 measurement range/2) = 20.000 – 10.000 | –5 V | BAS SET |
| Ī | 20.000 | Thickness value = 20.000 | 0 V | MAIN |
| Ī | 30.000 | Thickness value+ (CH2 measurement range/2)= 20.000+10.000 | 5 V | APPL & SET METH |

* The measurement range for the ZX2-LD50 is ±10 mm.

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage Double

Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

7 Hold Optional

Set this item to hold measured values during the measurement period according to preset hold conditions.

(Use CH2 for these settings.)

| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|---------------------|--------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| INTRODUCTION | Press to disp | <u> </u> | Press the to button on the CH2 Amplifier Unit to display Hald. | Default value: OFF |
| PREPARATION For Measurement | | | Press the 💲 button to select the | OFF |
| FLOW OF OPERATION | Press to select | PERK Select the | hold conditions. | Hold OFF <u> <i>HIE</i></u> The average measured value |
| BASIC SETUP | | desired value. | | during the sampling period is held. P EO P |
| MAIN APPLICATIONS & SETTING METHODS | | | | The difference between the minimum and maximum values during the sampling period is held. |
| Height | | | | SRMPLE |
| Steps and Warpage | | | | The measured value at the start of the sampling period is held. |
| Double Sheet Detection | | | | boeling The minimum value during |
| Thickness | | | | the sampling period is held. |
| Positioning | | | | the sampling period is held. (For details, see page 95.) |
| Eccentricity and Surface Deflection | SMART MENU/SET | | Press the button to apply the setting. | * The clamp value is output until the first sampling period is finished. |
| DETAILED SETTINGS | | | When other than []FF is selected, proceed to "8 Trigger conditions," and | (For details on the clamp value, see page 111.) |
| TROUBLE- SHOOTING | | | when []FF is selected, proceed to "9 Threshold setting." | |
| SPECIFI- CATIONS | | |) | |
| INDEX | | | | |
| SETTING TRANSITION CHARTS | | | | |
| 62 | Thickness | | | ZX2 User's Manual |

8 Trigger conditions Optional

(Use CH2 for these settings.)

| (Use CH2 for these settings.) | | | | | |
|-------------------------------|----------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------|--|
| Button Operation | Display | Description of Operation | Explanation of Selection Menu | CONTENTS | |
| Press to dis | <u> </u> | Press the ♦ button on the CH2 Amplifier Unit to display ∠RI []. | Default value: TIMING | INTRODUCTION | |
| day. | | Press the 💲 button to select the | ELMI NG | PREPARATION FOR MEASUREMENT | |
| Press to select | EL MI NG | trigger conditions. | Enter the trigger by using the timing input or by pressing the Southern the RUN | FLOW OF OPERATION | |
| | desired value. | | mode. The period that the timing signal is ON is the sampling period. | BASIC SETUP | |
| | | | SELF-d The sampling period is the period that the measured value is lower than the | MAIN APPLICATIONS & SETTING METHODS | |
| | | | specified self-trigger level. | Height Steps | |
| | | | The sampling period is the period that the measured value is greater than the | and Warpage Double | |
| | | | specified self-trigger level. (For details, see page 97.) | Sheet Detection | |
| SMART MENU/SET | | Press the button to apply the trigger conditions. | | Thickness Positioning | |
| | | When SELF-U and SELF-U are selected, proceed to the next item, and | | Eccentricity and Surface Deflection | |
| | | when EI MI NE is selected, proceed to "9 Threshold setting." | | DETAILED SETTINGS | |
| Press to disp | SELFLV | Press the \$ button to display | Default value: 0.000 | TROUBLE- SHOOTING | |
| | | Press the 🍣 button to enable | | SPECIFI- CATIONS | |
| | | setting of the self-trigger level. | | INDEX | |
| | L | | · | SETTING | |

SETTING TRANSITION CHARTS

| | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|-----------------------------------|------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| CONTENTS | [Change numeric value] | 99.999 | Press the (() button to move the digit, press the () button to change the numeric value, and set the self-trigger level. | * If the s button is pressed when the cursor is at the right-most digit or the s button is pressed when the |
| INTRODUCTION | Press to set. | Set any value. | | cursor is at the left-most digit, the setting will be canceled. |
| PREPARATION FOR MEASUREMENT | SMART MENU/SET | | Press the button to apply the setting. | |

9 Threshold Setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

(Use CH2 for these settings.)

| BASIC | | | | |
|-------------------------------------------------------------------|------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| SETUP | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| MAIN APPLICATIONS & SETTING METHODS Height | Press to display. | Lit H L MENU | Press the the button on the CH2 Amplifier Unit to display the HIGH threshold. | Setting example: Non-defective product thickness 3 to 8 mm |
| Steps and Warpage Double Sheet | | | Press the 🏶 button to enable setting of the HIGH threshold. | |
| Detection Thickness | [Change numeric value] | BODD Set any value. | Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the HIGH threshold. | Set the MAX and MIN thicknesses to be regarded as OK to the HIGH and LOW |
| Positioning | SMART MENU/SET | | Press the button to apply the setting. | thresholds, respectively. * If the \$ button is pressed |
| Eccentricity and Surface Deflection DETAILED SETTINGS | Press to daplay | Lit H L MENU | Press the the button to display the LOW threshold. | when the cursor is at the right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled. |
| TROUBLE- Shooting | | | Press the Sutton to enable setting of the LOW threshold. | * Set so that the HIGH threshold is greater than the LOW threshold. |
| SPECIFI- CATIONS | [Change numeric value] | 12,345 3,000 | Press the \$ button to move the digit, press the \$ button to change the numeric value, and | |
| INDEX | Press to set. | Set any value. | set the LOW threshold. | |
| SETTING TRANSITION | SMART MENU/SET | | Press the button to apply the setting. | |

CHARTS

64

FLOW OF

OPERATION

10 Return to RUN mode Required

Switch to the mode in which measurement is performed.

(Use CH1 and CH2 for these settings.)

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | CONTENTS |
|---------------------|---------|-------------------------------------------------------------------|----------------------------------|--------------|
| SMART MENU/SET | Out | Hold down the button for three seconds to switch to the RUN mode. | | INTRODUCTION |

* For details on optimizing settings, such as output and input, see "DETAILED FOR MEASUREMENT"

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

Positioning



INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height Steps

and Warpage Double

Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

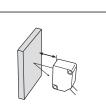
2

TRO SHO

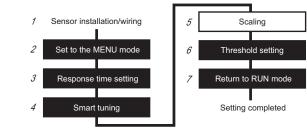
SP CA

INI

SET TRA



Procedure for setting up positioning





Sensor installation/wiring Required

Has the Sensor been installed and wired? (See page 23.)

Set the sensing object in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that the upper and lower limits of the distance between the Sensor Head and the sensing object is within the measurement range, and install the Sensor Head at this position.

Set to the MENU mode Required

Select the desired mode to set the measurement conditions in.

| ROUBLE- HOOTING | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|--------------------------------------|----------------------------------------------|-------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------|
| PECIFI- ATIONS | SMART MENU/SET Hold down for 3 seconds | Lit H L MENU | Hold down the three button for three seconds to switch to the MENU mode. | |
| IDEX ITTING IANSITION IARTS | Press to deplay. | delai l Baabaa | Press the ♦ button to display dELRI L. | * This operation is not required when scaling is not to be set. |

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|---------------------|----------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------|
| Press to display. | <u>delri L</u> On | Press the ♣ button to set the display to ☐N to set display of the detail menu. | | CONTENTS |
| SMART MENU/SET | | Press the b button to apply the setting. | | INTRODUCTION |
| 3 Resp | onse time setti | Select the r | esponse time to match the size speed of the sensing object. | PREPARATION FOR MEASUREMENT |
| | | ······································ | | FLOW OF OPERATION |
| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
| Press to | SPEEd | Press the 🔹 button to display | Default value: 500 ms | BASIC SETUP |
| display. | | | | MAIN APPLICATIONS & SETTING METHODS |
| | SPEEd | Press the 💲 button to select the response time. | Select the response time to match the size and moving | Height |
| Press to select | Select the | | speed of the sensing object. | Steps and |
| | desired value. | | 60 μs, 120 μs, 240 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, | Warpage Double |
| | | | 20 ms, 36 ms, 66 ms, 128 ms, 250 ms, 500 ms | Sheet Detection |
| SMART MENU/SET | | Press the button to apply the setting. | * After the response time is changed, the smart tuning | Thickness |
| | | U | results are cleared, so be sure to re-execute tuning. | Positioning |
| | 1 | | 1 | Eccentricity and Surface Deflection |

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

4 Smart tuning Required

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

| | | • | (| |
|-----------------------------------------------------------|---------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| INTRODUCTION | _ | _ | Check that the reference workpiece is set in place. | |
| PREPARATION FOR MEASUREMENT FLOW OF OPERATION | Hold down for 1 second | Pressing down SMARE J NGLE Pressed down EUNI NG SI NGLE | Press the button for one second. When SMARL/ SI NOLE is displayed, release your finger from the button to start execution of smart tuning. | If "FALLEC" flashes on the isub-display for three seconds, it indicates that tuning was not possible. Change the response time isetting to a larger value, and try again. |
| BASIC SETUP MAIN APPLICATIONS & SETTING | * To tune condition: | | ieces or to tune workpieces | having a different surface |
| & SETTING METHODS Height | 5 Scalir | g Optional | Set this item to change the display a digital value on the Amplifier Un measured value. (e.g. to display t | nit different from the actual |
| Steps and Warpage Double | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| Sheet Detection Thickness | Press to display, | <u>SCALE</u> 888888 | Press the 🌢 button to display SERLE . | Default value: OFF |
| Positioning Eccentricity and Surface Deflection | Press to display. | <u>SERLE</u> On | Press the 拳 button to display □N. | |
| DETAILED SETTINGS | SMART MENU/SET | | Press the button to enable setting of scaling. | |
| TROUBLE- SHOOTING | | | | |
| SPECIFI- CATIONS | | | | |
| INDEX | | | | |
| SETTING TRANSITION CHARTS | | | | |
| 68 | Positioning | | | ZX2 User's Manual |

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|--------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|
| Press to display, | <u>5 I-6EF</u> -99999 | Press the ♦ button to display 5 I-BEF . | <to actual="" display="" distance="" sensing="" the=""></to> | CONTENTS |
| | | Press the 🏶 button to enable setting of S1-Before. | -8 0 8 + 58 50 42 | INTRODUCTION PREPARATION FOR |
| [Change numeric value] More digit | -8000 [Numeric | Press the () button to move the digit, press the () button to change the numeric value, and set the measured value before | 58 After | FLOW OF OPERATION |
| Press to set. | value before change] Set any value. | S1 is changed. | Before -8 S1 S2 | BASIC SETUP |
| SMART MENU/SET | | Press the button to apply the numeric value of S1-Before. | * If the \$ button is pressed when the cursor is at the | MAIN APPLICATIONS & SETTING METHODS |
| Press to display | <u>5 I-RFE</u> -99999 | Press the ♦ button to display 5 I-RFE . | right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled. | Height Steps and Warpage |
| | | Press the 🏶 button to enable setting of S1-After. | | Double Sheet Detection |
| [Change numeric value] | 5 H-AFE 58,000 [Numeric value after change] | Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the measured value after S1 is changed. | | Thickness Positioning Eccentricity and Surface |
| SMART MENU/SET | Set any value. | Press the to apply the numeric value of S1-After. | | Deflection DETAILED SETTINGS |
| | | | | TROUBLE- SHOOTING |

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

| | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|-------------------------------------------|------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| CONTENTS | Press to display. | <u>52-66F</u> -99999 | Press the \$ button to display 52-667. | 58 42 |
| | | | Press the 🏶 button to enable setting of S2-Before. | 8 |
| PREPARATION FOR MEASUREMENT | [Change numeric value] | | Press the 😻 button to move | s1 s2 * If the sources is pressed |
| FLOW OF OPERATION | Press to set. | 52-66- 8,000 [Numeric | the digit, press the 💲 button to change the numeric value, and set the measured value before | when the cursor is at the right-most digit or the button is pressed when the cursor is at the left-most digit, |
| BASIC SETUP | | value before change] Set any value. | S2 is changed. | the setting will be canceled. |
| APPLICATIONS & SETTING METHODS | SMART MENU/SET | | Press the button to apply the numeric value of S2-Before. | |
| Height Steps and Warpage | Press to display. | <u>52-AFE</u> -99999 | Press the ♦ button to display 52-RFL . | |
| Double Sheet Detection | | | Press the Sutton to enable setting of S2-After. | |
| Thickness | [Change numeric value] | | Press the 😻 button to move | |
| Positioning | [Move digit] | 42,000 | the digit, press the s button to change the numeric value, and | |
| Eccentricity and Surface Deflection | Press to set. | [Numeric value after change] | set the measured value after S2 is changed. | |
| DETAILED SETTINGS | SMART MENU/SET | Set any value. | Press the 🛎 button to apply | |
| TROUBLE- SHOOTING | | | the numeric value of S2-After. | |
| SPECIFI- CATIONS | | | | |
| INDEX | | | | |
| SETTING TRANSITION CHARTS | | | | |

6 Threshold Setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | CONTENTS |
|------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------|
| Press to display. | Lit H L MENU | Press the 🏶 button to display the HIGH threshold. | Setting example: Non-defective product position 49 to 51 mm | INTRODUCTION |
| | | Press the Soutton to enable setting of the HIGH threshold. | | PREPARATION FOR MEASUREMENT |
| | | | 51 49 Set the positioning MAX and | FLOW OF OPERATION |
| [Change numeric value] | Set any value. | Press the (() button to move the digit, press the () button to change the numeric value, and set the HIGH threshold. | MIN distances to the HIGH and LOW thresholds, respectively. | BASIC SETUP |
| SMART MENU/SET | | Press the button to apply the setting. | * If the the button is pressed when the cursor is at the | MAIN APPLICATIONS & SETTING METHODS |
| Press | H L MENU | Press the to button to display the LOW threshold. | right-most digit or the \$ button is pressed when the | Height |
| is to display. | | | cursor is at the left-most digit, the setting will be canceled. | Steps and Warpage |
| | | Press the 🍣 button to enable setting of the LOW threshold. | * Set so that the HIGH threshold is greater than the | Double Sheet Detection |
| | | - | LOW threshold. | Thickness |
| [Change numeric value] | 49,000 Set any value. | Press the (**) button to move the digit, press the (*) button to change the numeric value, and | | Positioning |
| Press to set. | | set the LOW threshold. Press the button to apply | | Eccentricity and Surface Deflection |
| | | the setting. | | DETAILED SETTINGS |

7 Return to RUN mode Required

Switch to the mode in which measurement is performed.

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | SPECIFI- CATIONS |
|----------------------------------------------|---------|-------------------------------------------------------------------|-------------------------------|---------------------|
| SMART MENU/SET Hold down for 3 seconds | Out | Hold down the button for three seconds to switch to the RUN mode. | | INDEX |

For details on optimizing settings, such as output and input, see "DETAILED * SETTINGS."

SETTING TRANSITION CHARTS

TROUBLE-

SHOOTING

Eccentricity and Surface Deflection

INTRODUCTION

CONTENTS

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

1

3

4

5

1

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height Steps

and Warpage Double

Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DET SET

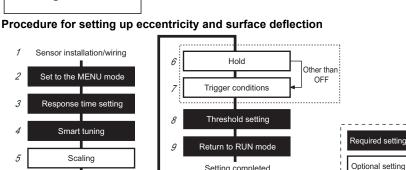
TRO SHO

SPI CA

IND

SET TRA CHARTS





Sensor installation/wiring Required

Has the Sensor been installed and wired? (See page 23.)

Set the sensing object in place, adjust the position of the Sensor Head while looking at the digital display values on the Amplifier Unit or the indicators on the Sensor Head so that the clearance between the Sensor Head and the sensing object is near the measurement center distance, and install the Sensor Head at this position.

Setting completed

2 Set to the MENU mode Required

Select the desired mode to set the measurement conditions in.

| TAILED | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------|----------------------------------------------|--------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| TTINGS OUBLE- OOTING | SMART MENU/SET Hold down for 3 seconds | Lit H L MENU | Hold down the button for three seconds to switch to the MENU mode. | |
| PECIFI- | Press to display. | <u>dEERI L</u> 888888 | Press the 🌢 button to display dELRI L. | * This operation is not required when scaling, hold and trigger conditions are not to be set. |
| DEX TTING ANSITION ARTS | Press to display. | <u>delri L</u> On | Press the 	 button to set the display to □N to set display of the detail menu. | |

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|---------------------|---------|----------------------------------------|----------------------------------|----------|
| SMART MENU/SET | | Press the button to apply the setting. | | CONTENTS |

3 Response time setting Required

Button

Select the response time to match the size and moving speed of the sensing object.

Explanation of

| PREPARATIO |
|------------|
| FOR |

INTRODUCTION

| Operation | Display | Description of Operation | Selection Menu | PREPARATION FOR MEASUREMENT |
|-------------------|---------------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Press to display. | <u>588888</u> | Press the \$ button to display SPEEd. | Default value: 500 ms | FLOW OF OPERATION |
| Press to select | Select the desired value. | Press the 💲 button to select the response time. | Select the response time to match the size and moving speed of the sensing object. 60 μ s, 120 μ s, 240 μ s, 500 μ s, 10 μ s, 20 μ s, 200 μ s, 200 μ s, 200 μ s, 36 ms, 66 ms, 128 ms, 250 ms, 500 ms | BASIC SETUP MAIN APPLICATIONS & SETTING METHODS Height Steps |
| SMART MENU/SET | | Press the button to apply the setting. | * After the response time is changed, the smart tuning | and Warpage Double |
| | | | results are cleared, so be sure to re-execute tuning. | Sheet Detection |

4 Smart tuning Required

Smart tuning sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece)

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Eccentricity and Surface Deflection |
|---------------------------------------------|---------------|------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| _ | — | Check that the reference workpiece is set in place. | | DETAILED SETTINGS |
| SMART MENU/SET Hold down for 1 second | Pressing down | Press the b utton for one second. When SMARL/ SI NGLE is displayed, release | If "FILED" flashes on the sub-display for three seconds, it indicates that tuning was not possible. | TROUBLE- SHOOTING |
| | Pressed down | your finger from the button to start execution of smart tuning. | Change the response time setting to a larger value, and | SPECIFI- CATIONS |
| | Flashing | | try again. | INDEX |
| | | | | |

* To tune multiple workpieces or to tune workpieces having a different surface condition: **page 80**

SETTING TRANSITION CHARTS

Thickness

Positioning

5 Scaling Optional

Set this item to change the display scale when you want to display a digital value on the Amplifier Unit different from the actual measured value. (e.g. to reverse the - and + indications)

| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| INTRODUCTION | Press to display. | <u></u> 888888 | Press the the button to display SERLE . | Default value: OFF |
| PREPARATION FOR MEASUREMENT FLOW OF OPERATION | Press to display. | <u>SCALE</u> ON | Press the ✤ button to display □N. | |
| BASIC | SMART MENU/SET | | Press the 👅 button to enable setting of scaling. | |
| SETUP MAIN APPLICATIONS & SETTING METHODS | Press to display. | <u>5 I-68F</u> -99999 | Press the 🌒 button to display 5 I-6EF - | To set the NEAR and FAR sides as - and + indications to the sensor: |
| Height Steps and | | | Press the 🏶 button to enable setting of S1-Before. | 0 |
| Warpage Double Sheet Detection Thickness | [Change numeric value] More of the set of th | [Numeric value before change] Set any value. | Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the measured value before S1 is changed. | 2 2 1 2 Before |
| Positioning | SMART MENU/SET | | Press the button to apply the numeric value of S1-Before. | -1After |
| Eccentricity and Surface Deflection DETAILED SETTINGS | Press to display | 5 -RFE -99999 | Press the ♦ button to display 5 I-RFE. | * If the \$ button is pressed |
| TROUBLE- SHOOTING | | | Press the Sutton to enable setting of S1-After. | when the cursor is at the right-most digit or the button is pressed when the cursor is at the left-most digit, |
| SPECIFI- CATIONS | [Change numeric value] | <u>13 I- RFL</u> 2000 | Press the (**) button to move the digit, press the (**) button to change the numeric value, and | the setting will be canceled. |
| INDEX | Press to set. | [Numeric value after change] Set any value. | set the measured value after S1 is changed. | |
| SETTING TRANSITION CHARTS | SMART MENU/SET | | Press the button to apply the numeric value of S1-After. | |

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|------------------------|------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| Press to display. | <u>52-66F</u> -99999 | Press the ♥ button to display 52-66F. | 2 1 1 2 9 Before | CONTENTS |
| | | Press the Sutton to enable setting of S2-Before. | After | INTRODUCTION |
| [Change numeric value] | | Press the 👀 button to move | S1 S2 | PREPARATION FOR MEASUREMENT |
| Press to set. | [Numeric value before | the digit, press the subtton to change the numeric value, and set the measured value before S2 is changed. | * If the \$ button is pressed when the cursor is at the right-most digit or the \$ | FLOW OF OPERATION |
| | change] Set any value. | | button is pressed when the cursor is at the left-most digit, the setting will be canceled. | BASIC SETUP |
| SMART MENU/SET | | Press the button to apply the numeric value of S2-Before. | | MAIN APPLICATIONS & SETTING METHODS |
| Press to display | <u>52-RFE</u> -99999 | Press the 🏶 button to display 52-RFE . | | Height Steps and |
| | | Press the 🏶 button to enable setting of S2-After. | | Warpage Double Sheet Detection |
| [Change numeric value] | <u>52-8FE</u> | Press the 🗱 button to move the digit, press the 💲 button to | | Thickness |
| Press to set. | [Numeric value after change] | change the numeric value, and set the measured value after S2 is changed. | | Positioning Eccentricity and Surface Deflection |
| SMART MENU/SET | Set any value. | Press the 🗯 button to apply | | DETAILED |
| | | the numeric value of S2-After. | | SETTINGS |
| 6 Hold | Optional | Set this item to hold measured valu period according to preset hold co | | TROUBLE- SHOOTING |

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | SPECIFI- CATIONS |
|---------------------|---------|----------------------------------------|-------------------------------|---------------------------------|
| Press to di | HOLd | Press the ♦ button to display H□Ld. | Default value: OFF | INDEX |
| splay. | | | | SETTING TRANSITION CHARTS |

| | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|---------------------|--------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| CONTENTS | Press In salect | PERK Select the | Press the 💲 button to select the hold conditions. | Hold OFF |
| INTRODUCTION | | desired value. | | during the sampling period is held. P EC P |
| PREPARATION For Measurement | | | | The difference between the minimum and maximum |
| FLOW OF OPERATION | | | | values during the sampling period is held. |
| BASIC SETUP | | | | The measured value at the start of the sampling period is held. |
| MAIN APPLICATIONS & SETTING METHODS | | | | The minimum value during the sampling period is held. |
| Height | | | | The maximum value during the sampling period is held. |
| Steps and Warpage | | | MU197 | (For details, see page 95.) |
| Double Sheet Detection | SMART MENU/SET | | Press the button to apply the setting. | * The clamp value is output until the first sampling period is finished. |
| Thickness | | | When other than DFF is selected, proceed to "7 | (For details on the clamp value, see page 111.) |
| Positioning | | | Trigger conditions," and when DFF is selected, proceed to "8 Threshold | |
| Eccentricity and Surface Deflection | | | setting." | |

DETAILED

7

Trigger conditions Optional

Set how timing of the hold measurement period is to be input.

| TROUBLE- SHOOTING | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------|---------------------|----------|------------------------------------------|----------------------------------|
| SPECIFI- CATIONS | Press to display | <u> </u> | Press the ♦ button to display 上RI []. | Default value: TIMING |
| INDEX | | | | |

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|------------------------|---------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| | ERIG EI MI NG | Press the 💲 button to select the trigger conditions. | Enter the trigger by using the timing input or by pressing the so button in the RUN | CONTENTS |
| Press to select | Select the desired value. | n | mode. The period that the timing signal is ON is the | INTRODUCTION |
| | | | sampling period. SELF-d The sampling period is the | PREPARATION For Measurement |
| | | | period that the measured value is lower than the specified self-trigger level. | FLOW OF OPERATION |
| | | | SELF-U The sampling period is the period that the measured | BASIC SETUP |
| | | | value is greater than the specified self-trigger level. (For details, see page 97.) | MAIN APPLICATIONS & SETTING METHODS |
| SMART MENU/SET | | Press the button to apply | | Height |
| | | the trigger conditions. (When $5ELF-U$ and | | Steps and Warpage |
| | | SELF - d are selected, proceed to the next item, and when b M N is selected, | | Double Sheet Detection |
| | | proceed to "8 Threshold setting." | | Thickness |
| Press to di | <u>SELF,LV</u> | Press the ♦ button to display SELFLV. | Default value: 0.000 | Positioning |
| splay. | | | | Eccentricity and Surface Deflection |
| | | Press the Soutton to enable setting of the self-trigger level. | | DETAILED SETTINGS |
| [Change numeric value] | SELFLV | Press the 😻 button to move the digit, press the 💲 button to | * If the \$ button is pressed when the cursor is at the | TROUBLE- SHOOTING |
| Press to set. | Set any value. | change the numeric value, and set the self-trigger level. | right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled. | SPECIFI- CATIONS |
| SMART MENU/SET | | Press the button to apply the setting. | | INDEX |
| | | <u> </u> | <u> </u> | SETTING TRANSITION CHARTS |

8 Threshold Setting Required

Set the range of measured values to be judged as PASS by setting the HIGH and LOW thresholds.

| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|-----------------------------------------------------------|------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| INTRODUCTION | Press to display. | Lit H L MENU | Press the the button to display the HIGH threshold. | Setting example: Non-defective product eccentricity -1 to 1 mm |
| PREPARATION FOR MEASUREMENT FLOW OF OPERATION | | | Press the 🏶 button to enable setting of the HIGH threshold. | 1 mm -1 mm |
| BASIC SETUP | [Change numeric value] | Set any value. | Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the HIGH threshold. | H P L Set the eccentricity MAX and MIN distances to be regarded as OK to the HIGH |
| MAIN APPLICATIONS & SETTING METHODS | SMART MENU/SET | | Press the button to apply the setting. | and LOW thresholds, respectively. |
| Height Steps and Warpage | Press to display. | H L MENU | Press the \$ button to display the LOW threshold. | * If the \$ button is pressed when the cursor is at the right-most digit or the \$ button is pressed when the |
| Double Sheet Detection | | | Press the 拳 button to enable setting of the LOW threshold. | cursor is at the left-most digit, the setting will be canceled. |
| Thickness | | | Dress the AA button to move | * Set so that the HIGH |
| Positioning Eccentricity | [Change numeric value] | - (000 Set any value. | Press the \$ button to move the digit, press the \$ button to change the numeric value, and set the LOW threshold. | threshold is greater than the LOW threshold. |
| and Surface Deflection | SMART MENU/SET | | Press the button to apply the setting. | |

SETTINGS

TROUBLE-SHOOTING 9

SETTING TRANSITION CHARTS

Return to RUN mode Required

Switch to the mode in which measurement is performed.

| SPECIFI- CATIONS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|---------------------|----------------------------|---------|------------------------------------------|----------------------------------|
| CATIONS | SMART MENU/SET | Out | Hold down the 🖱 button for | |
| INDEX | Hold down for 3 seconds | | three seconds to switch to the RUN mode. | |

* For details on optimizing settings, such as output and input, see "DETAILED SETTINGS."

DETAILED SETTINGS

| Smart Tuning (Optimizing the Sensing Conditions) | 80 |
|-------------------------------------------------------------------------------------------------------------------------|--------------|
| Selecting the Initial Sub-Display | 84 |
| Connecting Two or More Amplifier Units | 86 |
| Mutual Interference Prevention | 88 |
| Setting the Hysteresis (Improving Unstable Measurement Near the Judgement Threshold) | 91 |
| Setting the Hold Function (Holding Measured Values Under Special Conditi | 93 ons) |
| Bank Setting | 99 |
| Zero Reset | 101 |
| Scaling (Changing Digital Values for Specific Measured Va | 105 lues) |
| Analog Output | 109 |
| Output for Non-measurement (Output Setting During Input of the Reset Signa at an Error) | 111 I |
| Timer | 114 |
| Setting the Differential Function | 116 |
| External Input for Bank, Timing Input, Reset Input | 118 |
| Setting the Detection Surface Selection (Decreasing Incorrect Measurement Caused by Multireflection on Workpiece) | 120 |
| Key Lock Function | 122 |
| Initializing Settings Data | 123 |

Smart Tuning

Setting channels used when connecting multiple units If mutual interference prevention is ON: CH1 If mutual interference prevention is set to OFF: Each CH

Smart tuning:

CONTENTS

This setting option sets optimum sensing conditions according to the operating conditions (response time and color/state of workpiece).

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Heiaht

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

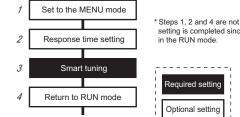
DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-

INDEX

SETTING TRANSITION CHARTS



Procedure for setting up smart tuning

* Steps 1, 2 and 4 are not required when the response time setting is completed since smart tuning can be performed even

Setting completed

Important

 When connecting two or more Amplifier Units and mutual interference prevention is set to ON, use the CH1 Amplifier Unit to execute tuning. After smart tuning execution for CH1 ends, it is also executed for the Amplifier Units of CH2 and later.

If the tuning result is NG for either Amplifier Unit, the smart tuning setup results are not applied to any amplifier units.

1 Set to the MENU mode Optional

Response time setting Optional

Display

22220

| Button Operation | Displ | ay | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|-------|-----|--------------------------------------------------------------------------|----------------------------------|
| SMART MENU/SET Hold down for 3 seconds | | Lit | Hold down the button for three seconds to switch to the MENU mode. | |

Description of Operation

Press the \$ button to display

SPEEd.

7

Button

Operation

CATIONS

80

Explanation of

Selection Menu

Default value: 500 ms

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | | |
|---------------------|---------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------|
| Press to select | Select the desired value. | Press the 💲 button to select the response time. | Select the response time to match the size and moving speed of the sensing object. 60 µs, 120 µs, 240 µs, 500 µs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms, 250 ms, 500 ms | CONTENTS INTRODUCTION | |
| SMART MENU/SET | | Press the 🖱 button to apply | * After the response time is | FOR MEASUREMENT | |
| | | the setting. | the setting. | changed, the smart tuning results are cleared, so be sure to re-execute tuning. | FLOW OF OPERATION |

3 Smart tuning Required

Select from one of the following three methods to execute smart tuning:

- (1) Tuning of a single stationary workpiece: Single smart tuning
- (2) Tuning of multiple stationary workpieces: Multi-smart tuning (a mix of workpieces having different color and state)
- (3) Tuning of workpieces having different surface states: Active smart tuning (execution of tuning while workpieces are moving)

(1) Tuning of a single stationary workpiece: Single smart tuning

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Thickness |
|---------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| _ | _ | Set the reference workpiece in place. | | Positioning |
| Hold down for t second | Pressing down | Press the button for one second. When SMARE/ SINGLE is displayed, release your finger from the button to start execution of smart tuning. | If "FRIES" flashes on the sub-display for three seconds, it indicates that ituning was not possible. Change the response time setting to a larger value, and try again. | Eccentricity and Surface Deflection |

SPECIFI-CATIONS

BASIC

SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and

Warpage Double Sheet

Detection

INDEX

| (a mix of workpieces having unrefer color and state) | | | | | | | |
|------------------------------------------------------|----------------------------------------------|---------------|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|------------------------------------------------|--|--|
| | Button Operation | Display | Description of Operation | Explanation of Selection Menu | | | |
| CONTENTS | _ | _ | Set reference workpiece 1 in place. | | | | |
| INTRODUCTION | SMART MENU/SET Hold down for 3 seconds | Pressing down | Press the button for three seconds. When SMARE / MULEI is displayed, release | * SMARE /SI NELE is displayed for one to three seconds after the button is | | | |
| Preparation For Measurement | | Pressed down | your finger from the button to start execution of smart tuning. | pressed, and then 5MRRE/ MULEF is displayed. | | | |
| FLOW OF OPERATION | | | | If "FALLED" flashes on the sub-display for three seconds, it indicates that | | | |
| BASIC SETUP | | | | tuning was not possible. Change the response time setting to a larger value, and | | | |
| MAIN APPLICATIONS & SETTING METHODS | | | Swap the workpiece with reference workpiece 2 and set it | try again. | | | |
| Height | — | _ | in place. | | | | |
| Steps and Warpage | SMART MENU/SET Hold down for 3 seconds | Pressing down | Press the button for three seconds. When SMRRL / MULLI is displayed, release | The optimum conditions are set for either reference workpiece 1 or 2 is set. | | | |
| Double Sheet Detection | | Pressed down | ↓ Pressed down | your finger from the button to start execution of smart tuning. | * SMRRE /SI NELE is displayed for one to three | | |
| Thickness | | | When there are three or more reference workpieces, swap | seconds after the button is pressed, and then 도M뮤R上/ MULLLI is displayed. | | | |
| Positioning | | | each workpiece and repeat the procedure. | If you release your finger from the button SMRRE / SI NGLE, the result of tuning | | | |
| Eccentricity and Surface Deflection | | | | workpiece 1 will not be reflected. If " FRI LED" flashes on the sub-display for three | | | |
| DETAILED SETTINGS | | | | seconds, it indicates that tuning was not possible. Change the response time | | | |
| TROUBLE- Shooting | | | | Isetting to a larger value, and try again. | | | |
| SPECIFI- CATIONS | | | | | | | |
| INDEX | | | | | | | |
| SETTING TRANSITION CHARTS | | | | | | | |

(2) Tuning of multiple stationary workpieces: Multi-smart tuning (a mix of workpieces having different color and state)

| (executio | (execution of tuning while workpieces are moving) | | | | |
|-------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------|--|
| Button Operation | Display | Description of Operation | Explanation of Selection Menu | | |
| SMART MENU/SET | Pressing down | Press the button for five seconds with the workpiece set | * SMRRE/SI NGLE and SMRRE/MULEI are | CONTENTS | |
| Hold down for 5 seconds | SMARE ALEI VE | in place. When $SMRRE/$ REE/VE is displayed, release your finger from the button to | displayed for one to five seconds after the button is pressed, and then SMARE / | INTRODUCTION | |
| | | start execution of smart tuning. | REIVE is displayed. | PREPARATION FOR MEASUREMENT | |
| | Flashing | smart tuning continues, move the workpiece. | | FLOW OF OPERATION | |
| Hold down for 5 seconds | | At the end of the desired tuning period, press the button again for 5 to end tuning. | The optimum setting conditions will be set. | BASIC SETUP | |
| | | | sub-display for three seconds, it indicates that tuning was not possible. | MAIN APPLICATIONS & SETTING METHODS | |
| | | | Change the response time setting to a larger value, and | Height | |
| 4 Return to RUN mode Optional | | | | | |
| | | | | Double | |

| (3) Tuning of workpieces having different surface states: Active smart tuning |
|-------------------------------------------------------------------------------|
| (execution of tuning while workpieces are moving) |

| 4 | Return to RUN mode Optional |
|---|-----------------------------|
|---|-----------------------------|

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Sheet Detection |
|----------------------------|----------|---------------------------------------------------------|----------------------------------|--------------------|
| SMART MENU/SET | Out | Hold down the button for three seconds to switch to the | | Thickness |
| Hold down for 3 seconds | H L MENU | RUN mode. | | Positioning |

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Selecting the Initial Sub-Display

Setting channels used when connecting multiple units: Each CH

CONTENTS

Initial sub-display:

Set to the MENU mode

Sub-display memory setting

Return to RUN mode Setting completed

Set to the MENU mode

Display

Lit

MENU

1

2

3

1

Button

Operation

SMART MENU/SET

Hold down fo 3 seconds

The initial sub-display is the display that appears when the power is turned on.

Description of Operation

Hold down the 🖱 button for

three seconds to switch to the

MENU mode.

INTRODUCTION Procedure for setting up initial sub-display

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Heiaht

Steps and Warpage

Double Sheet Detection

2 Sub-display memory setting

П

| T 1 (1) | | | | |
|----------------------------------------------------------|---------------------|---------------------------|------------------------------------------------------|----------------------------------|
| Thickness | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| Positioning Eccentricity and Surface Deflection | Press to display; | SUBMEM | Press the I button to display | Default value: HIGH |
| DETAILED SETTINGS | | R-CUL LOW | Press the 💲 button to select the sub-display memory. | HI CH HIGH threshold |
| TROUBLE- Shooting | Press to select | Select the desired value. | | LOW threshold |
| SPECIFI- CATIONS | | | | ے Resolution |
| INDEX | | | | REAL Current value |
| SETTING TRANSITION | | | | BANK |

S CHARTS

84

Explanation of

Selection Menu

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|---------------------|---------|----------------------------------------|----------------------------------|----------|
| SMART MENU/SET | | Press the button to apply the setting. | | CONTENTS |

3 Return to RUN mode

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | PREPARATION |
|----------------------------|----------|---------------------------------------------------------|----------------------------------|----------------------|
| SMART MENU/SET | Out | Hold down the button for three seconds to switch to the | | MEASUREMENT |
| Hold down for 3 seconds | H L MENU | RUN mode. | | FLOW OF OPERATION |



INTRODUCTION

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Connecting Two or More Amplifier Units

CONTENTS

Use a Calculating Unit to connect Amplifier Units when performing calculations between Amplifier Units and to prevent mutual interference between Sensor Heads.

The number of Amplifier Units that can be connected differs depending on the functions to be used.

| | Function | Number of C | onnectable Amplifier Units | See: | | |
|-----------------------------|------------------------------------------------------------------------------------------------------|----------------------------|----------------------------------------------------------------|--------------------------|--|--|
| PREPARATION FOR | Calculation | Up to two units (Up to | o five units can be connected. | (A-B) | | |
| MEASUREMENT | | However, calculations | s are done between pairs of two.) | calculation: | | |
| | | For (A-B) c | alculations | Page 47 | | |
| FLOW OF OPERATION | | A: CH2 or | ater | Thickness | | |
| OF ERGHIOR | | B: CH1 | | calculation: | | |
| BASIC | | | CH1 CH2 | Page 57 | | |
| SETUP | | | | | | |
| | | | CH4 CH4-CH1) | | | |
| MAIN APPLICATIONS | | | (CH4-CH1) (CH5-CH1) | | | |
| & SETTING METHODS | Mutual interferen | aa Ula ta fiya yaita | (Ch3-Ch1) | Page 88 | | |
| | prevention | ce op to live units | Up to five units | | | |
| Height | prevention | | | | | |
| Steps | Important | | | | | |
| and | Supply power to all connected Amplifier Units at the same time. | | | | | |
| Warpage | When connecti | ng two or more Amplifier U | Inits, the response times (maximu | m values) are as | | |
| Double Sheet | follows: | 3 | | · · · · , · · · · | | |
| Detection | Mutual Interferen | ce Two-Sensor | Total Response Time | | | |
| | Prevention | Operation | • | | | |
| Thickness | | OFF | Response time setting for ea | | | |
| | OFF | (A – B), THICK | (Total response time setting for e | | | |
| Positioning | | OFF | (4 ms × number of connected | , | | |
| | ON | (A – B), THICK | (Response time per unit (T) in the t number of connected un | | | |
| Eccentricity and Surface | | | | | | |
| Deflection | <response if="" interference="" is="" mutual="" on="" prevention="" set="" time="" to=""></response> | | | | | |
| | | CH1 Response Time Setting | Response Time per Unit (T) | | | |
| DETAILED | | 60 µs | 3 ms | | | |
| SETTINGS | | 120 µs | 3 ms | | | |
| | | 240 µs | 3 ms | _ | | |
| TROUBLE- SHOOTING | | 500 µs 1 ms | 4 ms | 4 | | |
| onoormo | | 1 1115 | 8 ms | 1 | | |

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

86

2 ms

4 ms

8 ms

12 ms

20 ms

36 ms

66 ms

128 ms

250 ms

500 ms

16 ms

32 ms

64 ms

72 ms

80 ms

100 ms

160 ms

280 ms

520 ms

1 s

The displayed and set up menus differ depending on the channel when two or more Amplifier Units are connected and when mutual interference prevention is set to ON.

Use the Amplifier Units of the corresponding channel numbers to specify settings by referring to the tables below.

INTRODUCTION

CONTENTS

<Menus and setting channels when two or more Amplifier Units are connected>

| Menu | CHs Used to Specify Settings | CHs Not Used to Specify Settings | Notes | PREPARATION FOR MEASUREMENT |
|-------------------------------------------|------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------------------------------------------|
| Mutual interference prevention 도님NC | - | CH2 to CH5: These cannot be used. (The setting menu is not displayed on the digital display.) | The setting of CH1 is also applied to Amplifier Units of CH2 and later. | FLOW OF OPERATION |
| Two-sensor operation setting | CH5 | CH1: This cannot be used. (The setting menu is not displayed on the digital display.) | | BASIC SETUP |
| Thickness setting | | | | MAIN APPLICATIONS & SETTING METHODS |
| Bank switching setting 占用NK | CH1 | CH2 to CH5: These cannot be used. (The setting menu is not displayed on the digital display.) | The Amplifier Units of CH2 and later are switched together with CH1. (Bank | Height |
| | | | registration is possible for individual amplifier units.) • Also use CH1 to switch the | Steps and Warpage |
| | | | banks by means of an external input. | Double Sheet Detection |
| Initialization I NI E | | CH2 to CH5: These cannot be used. (The setting menu is not displayed on the digital display.) | The Amplifier Units of CH2 and later are initialized together with CH1. | Thickness |

<Menus and setting channels when mutual interference prevention is set to ON>

| Menu | CHs Used to Specify Settings | CHs Not Used to Specify Settings | Notes | Eccentricity and Surface Deflection |
|-----------------------------------|------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------|
| Response time setting SPEEd | - | | The setting of CH1 is also applied to Amplifier Units of CH2 and later. | DETAILED SETTINGS |
| Smart tuning | | executed for these separately. | Smart tuning for the Amplifier Units of CH2 and later are executed together with CH1. | TROUBLE- SHOOTING |

(For details on the setup procedure when mutual interference prevention is set to ON, see the next page.)

INDEX

SPECIFI-

CATIONS

Positioning

Mutual Interference Prevention [Setting channel: CH1]

This refers to the function for preventing the influence of Sensor Heads when

mounted close to each other. (This function can be used for up to five Amplifier Units connected by using Calculating Units (ZX2-CAL).) INTRODUCTION Note: When the mutual interference prevention function is ON, external input cannot be used. PREPARATION Procedure for setting up mutual interference prevention FOR MEASUREMENT Amplifier Unit Set to the MENU mode Calculating Unit 1 FLOW OF Set on CH1 Amplifier Unit OPERATION Mutual interference 2 prevention setting BASIC 3 Return to RUN mode CH1 SETUP CH2 Setting completed сна MAIN APPLICATIONS сни & SETTING CH5 METHODS Heiaht Set to the MENU mode Steps and **Button** Explanation of Warpage Display Description of Operation Selection Menu Operation Double Sheet Hold down the 🖱 button of the SMART MENU/SET Detection Lit CH1 Amplifier Unit for three Π П MENU old down fo seconds to switch to the MENU Thickness mode. Press the \$ button to display * This step is not required if Positioning dFFBI defai L. detail menu display is already set to ON in the Eccentricity and Surface MENU mode Deflection Press the <> button to set the DETAILED display to IN to set display of SETTINGS the detail menu. TROUBLE-Press the button to apply SHOOTING SMART MENU/SET the setting. SPECIFI-CATIONS INDEX SETTING TRANSITION CHARTS

88

Mutual interference prevention:

CONTENTS

2 Mutual interference prevention setting

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|---------------------|-------------|--------------------------------------|----------------------------------|-----------------------------------|
| Press | SYNC | Press the Solution to display | Default value: OFF | CONTENTS |
| to display. | 888888 | | | INTRODUCTION |
| | <u>Syne</u> | Press the ♥ button to display □N. | | PREPARATION FOR MEASUREMENT |
| Press to display. | | 100.09 | | FLOW OF |
| SMART MENU/SET | | Press the button to apply | | |
| | | the setting. | | BASIC SETUP |

3 Return to RUN mode

| | | | | | | APPLICATIONS |
|---|----------------------------|-------|------|----------------------------------------|----------------|----------------------|
| | Button | Displ | lav | Description of Operation | Explanation of | & SETTING METHODS |
| | Operation | | - 5 | ···· • • • • • • • • • • • • • • • • • | Selection Menu | Height |
| | SMART MENU/SET | | | Hold down the 👅 button for | | |
| | | | Out | three seconds to switch to the | | Steps |
| | Hold down for 3 seconds | HL | MENU | RUN mode. | | and |
| | 3 seconds | | | RUN HIUUE. | | Warpage |
| 1 | | | | | | Double |

Important

• When CH1 is used to specify a setting while mutual interference prevention is set to ON, the menus for which the same setting is applied to the Amplifier Units of CH2 and later are shown in the following table.

Specify settings for the menus in the following table after setting mutual interference prevention to ON.

| Menu | Displayable and Specifiable CH Number | Notes | | Eccentricity and Surface Deflection |
|-----------------------|------------------------------------------|------------------------------------------------------------------------------------------|---|-------------------------------------------|
| Response time setting | CH1 | The setting of CH1 is also applied to Amplifier Units of CH2 and later. | i | DETAILED |
| Smart tuning | | Smart tuning for the Amplifier Units of CH2 and later are executed together with CH1. | | SETTINGS |

• When connecting two or more Amplifier Units, the response times (maximum values) are as follows:

| Mutual Interference Prevention | Two-Sensor Operation | Total Response Time | SPECIFI- |
|-----------------------------------|-------------------------|-----------------------------------------------------------------------------------|----------|
| | OFF | Response time setting for each CH | CATIONS |
| OFF | (A – B), THICK | (Total response time setting for each CH) + (4 ms × number of connected units) | INDEX |
| ON | OFF | (Response time per unit in the table below) × | |
| 011 | (A – B), THICK | number of connected units | SETTING |

MAIN

Sheet Detection

Thickness

Positioning

<Response time if mutual interference prevention is set to ON>

| CH1 Response Time Setting | Response Time per Unit |
|---------------------------|------------------------|
| 60 µs | 3 ms |
| 120 µs | 3 ms |
| 240 µs | 3 ms |
| 500 µs | 4 ms |
| 1 ms | 8 ms |
| 2 ms | 16 ms |
| 4 ms | 32 ms |
| 8 ms | 64 ms |
| 12 ms | 72 ms |
| 20 ms | 80 ms |
| 36 ms | 100 ms |
| 66 ms | 160 ms |
| 128 ms | 280 ms |
| 250 ms | 520 ms |
| 500 ms | 1 s |

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC

SETUP

MAIN APPLICATIONS & SETTING

Height Steps

METHODS

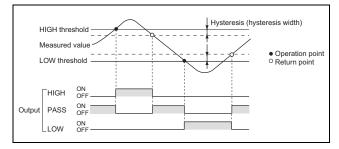
and Warpage

Double Sheet Detection

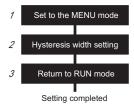
Thickness

Hysteresis width:

This refers to the difference between the operation point and return point. Set the hysteresis width for the upper and lower limits of the judgements if the HIGH, PASS or LOW judgement is unstable near the threshold values.



Procedure for setting up the hysteresis width



Set to the MENU mode

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Positioning |
|----------------------------------------------|-----------------|--------------------------------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------|
| SMART MENU/SET Hold down for 3 seconds | Lit H L MENU | Hold down the button for three seconds to switch to the MENU mode. | | Eccentricity and Surface Deflection |
| T A | | Press the 🕸 button to display | * This step is not required if | SETTINGS |
| Press to display. | <u>888888</u> | delai l. | detail menu display is already set to ON in the MENU mode. | TROUBLE- SHOOTING |
| | delai L | Press the ♣ button to set the display to □N to set display of the detail menu. | | SPECIFI- CATIONS |
| Press to display. | | | | INDEX |
| SMART MENU/SET | | Press the 🖱 button to apply | | |
| | | the setting. | | SETTING TRANSITION |

CHARTS

2 Hysteresis width setting

| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|---------------------|------------------|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| INTRODUCTION | Press to display. | 888888 888888 | Press the 🏼 button to display H님도 . | Default value: 0.000 |
| PREPARATION FOR MEASUREMENT | | | Press the 🏶 button to enable setting of the hysteresis width. | |
| FLOW OF OPERATION | Press to display. | | Press the 🔹 button to move | * If the \$ button is pressed |
| BASIC SETUP | Press to set. | Set any value. | the digit, press the \$\$ button to change the numeric value, and set the hysteresis width. | when the cursor is at the right-most digit or the \$ button is pressed when the |
| MAIN APPLICATIONS & SETTING METHODS | | | | cursor is at the left-most digit, the setting will be canceled. |
| Height | SMART MENU/SET | | Press the button to apply the setting. | |
| Steps and | 3 Botur | n to PUN mod | • | |

3 **Return to RUN mode**

| Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|-----------------|-------------------------------------------------------------------|----------------------------------|
| SMART MENU/SET Hold down for 3 seconds | Out H L MENU | Hold down the button for three seconds to switch to the RUN mode. | |

Important

- The hysteresis width for HIGH, PASS or LOW judgment is disabled when the hold function is enabled.
- The hysteresis width is enabled when the self-trigger is set.

DETAILED SETTINGS

Warpage Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

92

Setting the Hold Function Setting channels used when connecting multiple units: Each CH

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

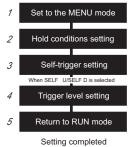
Height

OPERATION

Hold:

The hold function holds any values during the measurement period (sampling period), and outputs these values at the end of measurement.

Procedure for setting up hold



1 Set to the MENU mode

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Steps and Warpage |
|----------------------------------------------|---------|--------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------|
| SMART MENU/SET Hold down for 3 seconds | | Hold down the button for three seconds to switch to the MENU mode. | | Double Sheet Detection |
| Press | dEERI L | Press the 🏘 button to display | * This step is not required if detail menu display is | Thickness |
| Press to display; | 888888 | | already set to ON in the MENU mode. | Positioning |
| | delai L | Press the ♥ button to set the display to □N to set display of the detail menu. | | Eccentricity and Surface Deflection |
| Press to display. | | | - | DETAILED SETTINGS |
| SMART MENU/SET | | Press the 👅 button to apply | | |
| | | the setting. | | TROUBLE- SHOOTING |

SPECIFI-CATIONS

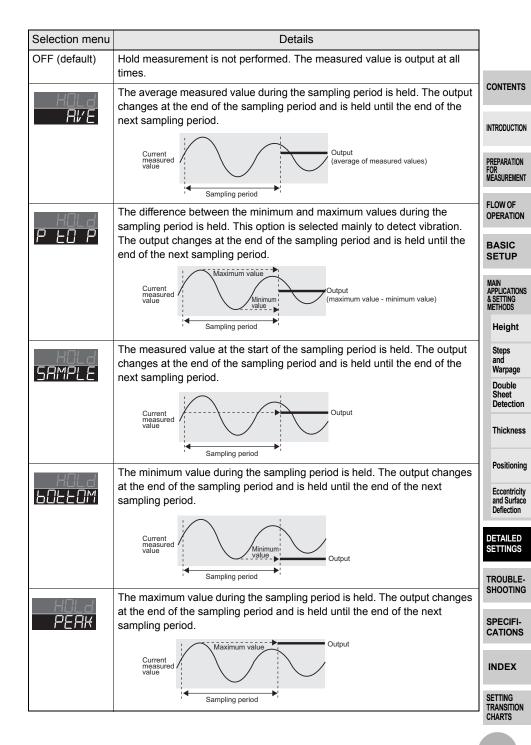
INDEX

2 Hold conditions setting

| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|---------------------|---------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| CONTENTS | | | Press the 🕸 button to display | Default value: OFF |
| INTRODUCTION | ress to display. | 888888 8888888 | HOLd. | |
| PREPARATION For Measurement | | HOLJ PEAK | Press the 💲 button to select the hold conditions. | BFF Hold OFF R⊬E |
| FLOW OF OPERATION | Press to select | Select the desired value. | | The average measured value during the sampling period is held. |
| BASIC SETUP | | | | PEDP The difference between the minimum and maximum |
| MAIN APPLICATIONS & SETTING METHODS | | | | values during the sampling period is held. |
| Height | | | | The measured value at the start of the sampling period is |
| Steps and Warpage | | | | held. |
| Double Sheet Detection | | | | The minimum value during the sampling period is held. |
| Thickness | | | | The maximum value during the sampling period is held. (For details, see the |
| Positioning | | | | following page.) |
| Eccentricity and Surface Deflection | SMART MENU/SET | | Press the to apply the setting. | * The clamp value is output until the first sampling period is finished. |
| DETAILED SETTINGS | | | When other than DFF is selected, proceed to "3 Self-trigger setting." | (For details on the clamp value, see page 111.) |
| TROUBLE- SHOOTING | | 1 | | <u>I</u> |
| SPECIFI- CATIONS | | | | |
| INDEX | | | | |

SETTING TRANSITION CHARTS

94



95

3 Self-trigger setting

| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|---------------------|---------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| CONTENTS | Pre | | Press the 🏶 button to display | Default value: TIMING |
| INTRODUCTION | s to display. | 888888 | ERI G. | |
| PREPARATION For Measurement | | ERIG El MI NG | Press the 💲 button to select the self-trigger. | EI MI NC Enter the trigger by using the timing input or by pressing |
| FLOW OF OPERATION | Press to select | Select the desired value. | | the Sutton in the RUN mode. The period that the timing signal is ON is the |
| BASIC SETUP | | | | sampling period. SELF-d The sampling period is the |
| MAIN APPLICATIONS & SETTING METHODS | | | | period that the measured value is lower than the specified self-trigger level. |
| Height | | | | SELF-U |
| Steps and Warpage | | | | The sampling period is the period that the measured value is greater than the |
| Double Sheet Detection | | | | specified self-trigger level. (For details, see the following page.) |
| Thickness | SMART MENU/SET | | Press the button to apply the self-trigger. | |
| Positioning | | | (When SELF-U and | |
| Eccentricity and Surface Deflection | | | SELF-d are selected, proceed to the next item, and when bl Ml NC is selected, | |
| DETAILED SETTINGS | | | proceed to "5 Return to RUN mode." | |
| TROUBLE- SHOOTING | | | | |
| SPECIFI- CATIONS | | | | |
| INDEX | | | | |

| Selection menu | Details | |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| ERIG ELMING (Default) | Either input the timing signal from an external device, or enter the trigger for starting sampling by pressing the \bigcirc button. The period that the timing signal is ON is the sampling period. | CONTENTS |
| | Timing input OFF | INTRODUCTION |
| | (For details on external inputs, see page 118.) | |
| | The sampling period is the period that the measured value is lower than the specified self-trigger level. Hold measurement is possible without a | PREPARATION FOR MEASUREMENT |
| | sync input. Measured value | FLOW OF OPERATION |
| | Self-trigger level Self-trigger level Sampling period Sampling period Sampling period | BASIC SETUP |
| <u>ERI 6</u> 551 5-11 | The sampling period is the period that the measured value is greater than the specified self-trigger level. Hold measurement is possible without a sync input. | MAIN APPLICATIONS & SETTING METHODS |
| | sync input. | Height |
| | Self-trigger level Hysteresis width | Steps and Warpage |
| | ● Operation point Sampling period Sampling period ○ Return point | Double Sheet Detection |
| A Trisney lay | | Thickness |

4 Trigger level setting

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Positioning Eccentricity |
|------------------------|--------------------------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-----------------------------|
| Press to display. | <u>SELF.L/</u> 888888 | Press the ♦ button to display SELFLV . | Default value: 0.000 | DETAILED SETTINGS |
| | | Press the Soutton to enable setting of the self-trigger level. | | TROUBLE- SHOOTING |
| [Change numeric value] | <u>561.F.L.//</u> | Press the (**) button to move the digit, press the (**) button to change the numeric value, and | * If the \$ button is pressed when the cursor is at the right-most digit or the \$ | SPECIFI- CATIONS |
| Press to set. | Set any value. | set the self-trigger level. | button is pressed when the cursor is at the left-most digit, | INDEX |
| | | | the setting will be canceled. | SETTING TRANSITION |

| Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|---------------------|---------|----------------------------------------|----------------------------------|
| SMART MENU/SET | | Press the button to apply the setting. | |

RUN mode.

INTRODUCTION

CONTENTS

5 Return to RUN mode

| PREPARATION | Button Operation | Display | Description of Operation |
|-------------|---------------------|---------|---------------------------------------------------------|
| MEASUREMENT | SMART MENU/SET | | Hold down the button for three seconds to switch to the |

fold down fo

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Heiaht

Steps and Warpage Double

Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

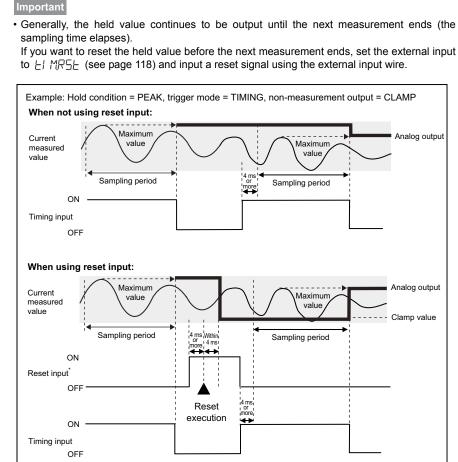
DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS



* For the reset input timing, see the timing chart on page 144.

Explanation of

Selection Menu

Bank Setting

Setting channels used when connecting multiple units Bank switching: CH1 Bank registration: Each CH

The following menu settings can be registered to banks:

Bank setting:

1

2

CONTENTS Up to four sets of settings can be stored in memory. (Default: bank 0) This is recommended, for example, when measuring on multi-lot lines.

> HIGH threshold LOW threshold Response time

Hysteresis width

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

| Pos | itio | ning | |
|-----|------|------|--|

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

| 4 Retu | arious settings Irm to RUN mode ting completed | Pre Po Pre Po Self Disp | asured value display scaling e-scaling display value 1 sst-scaling display value 1 e-scaling display value 2 sst-scaling display value 2 f-trigger level play during zero reset snig conditions en executing smart tuning | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| Important When connecting two or more Amplifier Units, use the CH1 Amplifier Unit for switching. The Amplifier Units of CH2 and later are switched together with CH1. Set to the MENU mode | | | | | | | |
| Button Operation | Display | Description of Operat | tion Explanation of Selection Menu | | | | |
| SMART MENU/SET Hold down for 3 seconds | Lit H L MENU | Hold down the to button three seconds to switch to MENU mode. | | | | | |
| Prest to display. | delai L | Press the 🏘 button to disp dELRI L. | play * This step is not required if detail menu display is already set to ON in the MENU mode. | | | | |
| Press to display. | <u>delri L</u> On | Press the 	 button to set display to □N to set displ the detail menu. | | | | | |
| | | Press the 👅 button to ap | | | | | |

the setting.

Procedure for setting up banks

Set to the MENU mode

Bank switching

2 Bank switching

| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|-----------------------------------|---------------------|---------------------------|----------------------------------------|-------------------------------|
| CONTENTS | Press | 6 ANK | Press the 🕸 button to display | Default value: 0 |
| INTRODUCTION | ss to display. | 888888 | . איוחם | |
| PREPARATION For Measurement | | <u> </u> | Press the 💲 button to select the bank. | to 3 |
| FLOW OF OPERATION | Press to select | Select the desired value. | | |
| BASIC SETUP | SMART MENU/SET | | Press the button to apply the setting. | |



Height

Steps and

Warpage

Double Sheet Detection

Thickness

Positioning

3 Various settings

Set the various menu items that require setting.

Execute smart tuning for each bank to be used because the smart tuning results are not applied to other banks.

4 Return to RUN mode

| Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|---------------------|-----------------|--------------------------------------------------------------------------|----------------------------------|
| SMART MENU/SET | Uut H L MENU | Hold down the button for three seconds to switch to the RUN mode. | |

Either switch banks by following the steps $1 \rightarrow 2 \rightarrow 4$ described above, or input the

The following explains how to switch banks and perform measurement.

required signal from an external device to switch the bank.

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Zero Reset

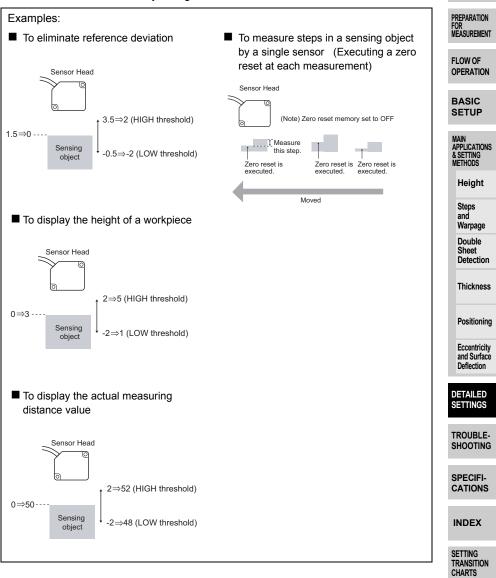
Setting channels used when connecting multiple units: Each CH i

CONTENTS

INTRODUCTION

Zero reset:

This refers to setting the reference value to "0" or any desired numeric value so that the measured value can be displayed and output as a positive or negative deviation (tolerance) from the reference value. The measured value can be set to "0" or any desired numeric value at any timing in the RUN mode.



Procedure for setting up zero reset

| | 1 | Set to the MENU mode | |
|--------------|---|-------------------------------|--|
| | 2 | Zero reset memory setting | |
| CONTENTS | 3 | Display setting at zero reset | |
| INTRODUCTION | 4 | Return to RUN mode | |
| | 5 | Zero reset execution | |
| PREPARATION | | Setting completed | |

PREPARATION For Measurement

1

Set to the MENU mode

2 Zero reset memory setting

| FLOW OF | | | | |
|---------------------------------------------------------|----------------------------------------------|----------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| OPERATION | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| BASIC SETUP | SMART MENU/SET Hold down for 3 seconds | Lit H L MENU | Hold down the button for three seconds to switch to the MENU mode. | |
| APPLICATIONS & SETTING METHODS Height | Press to display. | dELRI L 888888 | Press the 🏶 button to display dEERI L. | * This step is not required if detail menu display is already set to ON in the MENU mode. |
| Steps and Warpage Double Sheet Detection | Press to display. | <u>dELRI L</u> ON | Press the 	 button to set the display to □N to set display of the detail menu. | |
| Thickness | SMART MENU/SET | | Press the button to apply the setting. | |

Positioning

Eccentricity and Surface Deflection

D Si

TF Sł

Si C

IN

SE TR CH

Select whether or not to hold the measured value after the zero reset was performed when the power is turned OFF.

| | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------|---------------------|---------------------------|-------------------------------------------------------------|----------------------------------------------------------------|
| SETTINGS TROUBLE- SHOOTING | Press to display. | ZRMEM | Press the I button to display ZRMEM . | Default value: OFF |
| SPECIFI- CATIONS | | ZRMEM OFF | Press the 💲 button to select the zero reset memory setting. | Saves the current measured result. |
| NDEX | Press to select | Select the desired value. | | Does not save the current measured result. |
| Setting Transition Charts | | | | When executing a zero reset at each measurement, set to |

102

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|---------------------|---------|----------------------------------------|----------------------------------|----------|
| SMART MENU/SET | | Press the button to apply the setting. | | CONTENTS |

Important

3

Button

Operation

SMART MENU/SET

Display setting at zero reset

Display

Set any value.

. If zero reset memory is set to ON, the zero reset level will be written in the Amplifier Unit's non-volatile memory (EEPROM) each time a zero reset is executed.

PREPARATION FOR MEASUREMENT The EEPROM can be written a maximum of 100,000 times. Writing the zero reset level for each measurement can, therefore, use up the life of the memory and lead to malfunctions.

Description of Operation

Press the \$ button to display

Press the

 button to enable

Press the **()** button to move

the digit, press the 🕱 button to

change the numeric value, and

Press the button to apply

set the offset level.

the setting.

setting of values at a reset.

7RHI 5P.

Set the zero reset memory function to set the

Explanation of

Selection Menu

* If the 🔹 button is pressed

button is pressed when the

cursor is at the left-most digit,

the setting will be canceled.

when the cursor is at the

right-most digit or the 🔇

Default value: 0.000

reference value to any numeric value.

FLOW OF OPERATION

INTRODUCTION

BASIC SETUP

| | MAIN APPLICATION & SETTING |
|---|----------------------------------|
|) | METHODS |
| _ | Hoight |

Heign

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-

Δ Return to RUN mode

| Button | Display | Description of Operation | Explanation of | SHOOTING |
|----------------------------|----------|---------------------------------------------------------|----------------|----------|
| Operation | Display | | Selection Menu | SPECIFI- |
| SMART MENU/SET | Out | Hold down the button for three seconds to switch to the | | CATIONS |
| Hold down for 3 seconds | H L MENU | RUN mode. | | INDEX |

SETTING TRANSITION CHARTS

103

5 Zero reset execution

| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|-----------------------------------|-----------------------------|---------|-----------------------------------------------------------------------|-------------------------------------------------|
| INTRODUCTION | _ | _ | Set the sensing object to be used for executing the zero reset. | |
| PREPARATION FOR MEASUREMENT | | | or input the zero reset signal (4 | (For details on external inputs, see page 118.) |
| FLOW OF OPERATION | Hold both down for 1 second | 888888 | ms to 1 s) from an external device. | |

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Heiaht

Steps and Warpage Double

Sheet Detection

Thickness

Positioning

Eccentricity and Surface Def

D S

TF SI

S С

IN

SE TR CI

104

Important

- The minimum display value is -99.999, and the maximum display value is 999.999. If the measured value is below the minimum value after execution of zero reset, -99.999 will be displayed. 999.999 will be displayed if the measured value is above the maximum value. Zero reset can be executed only if the measured value is within ±10% of the rated measurement range.
 - · Even if a zero reset is executed, the threshold does not change from the setting before execution of the zero reset.

(For example, even if a zero reset is executed so that the measured value 2 becomes 0, the HIGH threshold stays at 5 if it is 5 before zero reset is executed.)

· After a zero reset, analog values are output in a range that corresponds to the zero-reset display value (initial value: 0 mm), which accords with the zero-reset distance point. (When the zero-reset display is 0 mm and scaling is set to OFF, the analog output value will be 3 V if the range is 1 to 5 V, 0 V if the range is -5 to 5 V, and 12 mA if the range is 4 to 20 mA.)

Procedure for canceling a zero reset

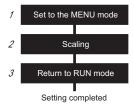
| | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------|------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| SETTINGS IROUBLE- SHOOTING | Hold both down for 1 second Hold both down for 1 second | 888888 | Either press the 💲 button for one second in the RUN mode, or input the zero reset signal (3 s or more) from an external | |
| SPECIFI- CATIONS | | | device. | <u>. </u> |
| NDEX | | | | |
| Setting Transition Charts | | | | |
| | | | | |

Scaling

Scaling:

The display scale can be changed when you want to display a digital value on the Amplifier Unit different from the actual measured value. (For example, when you want to set the measured value as the actual measuring distance.)

Procedure for setting up scaling



1 Set to the MENU mode

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Height Steps |
|----------------------------|----------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------|
| SMART MENU/SET | Lit | Hold down the button for | | and Warpage |
| Hold down for 3 seconds | H L MENU | three seconds to switch to the MENU mode. | | Double Sheet Detection |
| Press to displa | <u>dELAI L</u> | Press the 🏶 button to display dELRI L. | * This step is not required if detail menu display is already set to ON in the | Thickness |
| aș. | | | MENU mode. | Positioning |
| Press to display. | <u>dELRI L</u> ON | Press the ♣ button to set the display to □N to set display of the detail menu. | | Eccentricity and Surface Deflection |
| SMART MENU/SET | | Press the button to apply the setting. | - | DETAILED SETTINGS |

2 Scaling

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | SPECIFI- CATIONS |
|---------------------|--------------|-----------------------------------------|----------------------------------|---------------------------------|
| Press to day | <u>SCALE</u> | Press the 🌒 button to display SERLE. | Default value: OFF | INDEX |
| V V | | | | SETTING TRANSITION CHARTS |

TROUBLE-

SHOOTING

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

| | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|------------------------|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| CONTENTS | Press to display. | <u>SCALE</u> ON | Press the 拳 button to display □N. | |
| INTRODUCTION | SMART MENU/SET | | Press the button to enable setting of scaling. | |
| Preparation For Measurement | Press to display. | <u>5 I-6EF</u> -99999 | Press the 🌒 button to display 5 I-BEF . | <to actual="" display="" distance="" sensing="" the=""></to> |
| FLOW OF OPERATION BASIC | | | Press the 🏶 button to enable setting of S1-Before. | -8 0 8 + 58 50 42 |
| SETUP | IChange numeric value | | Press the 👀 button to move | |
| MAIN APPLICATIONS & SETTING METHODS | Press to set. | -8000 [Numeric | the digit, press the button to move change the numeric value, and set the measured value before | 58 After |
| Height | | value before change] | S1 is changed. | 8 Before |
| Steps and Warpage | | Set any value. | Press the 👅 button to apply | S1 S2 |
| Double | SMART MENU/SET | | the numeric value of S1-Before. | * If the \$ button is pressed when the cursor is at the |
| Detection | Press to display. | <u>5 -AFE</u> -99999 | Press the 🏼 button to display 5 I-RFE . | right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled. |
| Positioning | | | Press the s button to enable | |
| Eccentricity and Surface Deflection | | | setting of S1-After. | _ |
| DETAILED SETTINGS | [Change numeric value] | 5 - 95 - 58,000 [Numeric | Press the (**) button to move the digit, press the (**) button to change the numeric value, and set the measured value after S1 | |
| TROUBLE- SHOOTING | | value after change] Set any value. | is changed. | |
| SPECIFI- CATIONS | SMART MENU/SET | | Press the 👅 button to apply the numeric value of S1-After. | |
| INDEX | | | · | |
| SETTING TRANSITION CHARTS | | | | |

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | | | |
|-----------------------------|----------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--|--|
| Press to display. | <u>52-66F</u> | Press the 🌢 button to display 52-666 . | 58 After | CONTENTS | | |
| | | Press the 🏶 button to enable setting of S2-Before. | 8 Before | INTRODUCTION | | |
| [Change numeric value] | 52-66F | Press the 🐝 button to move the digit, press the 3 button to | * If the \$ button is pressed when the cursor is at the | PREPARATION FOR MEASUREMENT | | |
| Press to set. | [Numeric value before change] Set any value. | change the numeric value, and set the measured value before S2 is changed. | right-most digit or the button is pressed when the cursor is at the left-most digit, the setting will be canceled. | FLOW OF OPERATION | | |
| SMART MENU/SET | | Press the button to apply the numeric value of S2-Before. | | BASIC SETUP | | |
| Press to display. | 52-AFE -99999 | Press the 🌒 button to display 52-RFL . | | MAIN APPLICATIONS & SETTING METHODS | | |
| | | Press the 🏶 button to enable setting of S2-After. | | Height Steps and Warpage | | |
| [Change numeric value] | 52-RFL | Press the \$ button to move the digit, press the \$ button to | | Double Sheet Detection | | |
| Press to set. | [Numeric value after change] Set any value. | change the numeric value, and set the measured value after S2 is changed. | | Thickness | | |
| SMART MENU/SET | | Press the button to apply the numeric value of S2-After. | | Positioning | | |
| 3 Return to RUN mode | | | | | | |

3 **Return to RUN mode**

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | DETAILED SETTINGS |
|----------------------------------------------|---------|--------------------------------------------------------------------------|----------------------------------|----------------------|
| SMART MENU/SET Hold down for 3 seconds | Out | Hold down the button for three seconds to switch to the RUN mode. | | TROUBLE- SHOOTING |

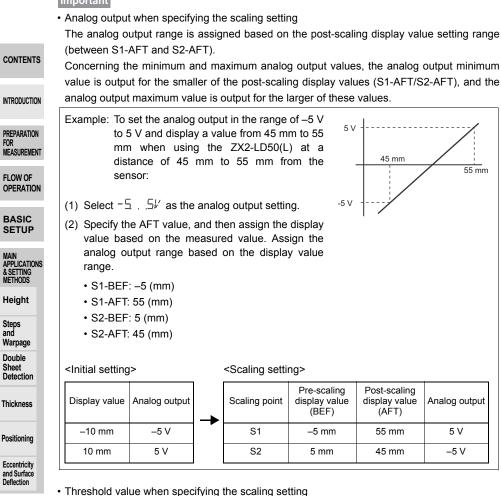
SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

107

Important



Even if scaling is executed, the threshold does not change from the setting before execution

of scaling. (For example, the HIGH threshold stays at 5 if it was 5 before scaling is executed.)

Detailed Settings

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

108 Scaling

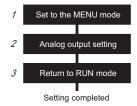
Analog Output

Analog output:

This refers to the conversion of measurement results to 4 to 20 mA current output or to -5 to +5 V/1 to 5 V voltage output.

The relationship between display values and analog output values can be freely INTRODUCTION specified. (Monitor focus)

Procedure for setting up analog output





| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Steps and Warpage |
|----------------------------|----------|---------------------------------------------------------|----------------------------------|------------------------------|
| SMART MENU/SET | | Hold down the button for three seconds to switch to the | | Double Sheet Detection |
| Hold down for 3 seconds | H L MENO | MENU mode. | | Thickness |

2 Analog output setting

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | Eccentricity and Surface Deflection |
|---------------------|---------------------------|---------------------------------------------|----------------------------------------------------|-------------------------------------------|
| Press to display. | <u>8-005</u> | Press the ♦ button to display 用一□凵上. | Default value: -5 to +5 V | DETAILED SETTINGS |
| | | Press the 💲 button to select analog output. | H_20MA Current output 4 to 20 mA | TROUBLE- SHOOTING |
| Press to select | Select the desired value. | | $\frac{1}{5}$ Voltage output 1 to 5 V -5, 5/ | SPECIFI- CATIONS |
| | | | Voltage output 5 to +5 V | INDEX |
| SMART MENU/SET | | Press the button to apply the setting. | | SETTING |
| | | | | TRANSITION |

TRANSITION

PREPARATION FOR MEASUREMENT

FLOW OF

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Positioning

OPERATION

3 Return to RUN mode

| | Button Operation | Display | D | escription of | Operation | | nation of on Menu | |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|---------|-----------------------------------------------------------------------|---------------------------------------|----------------------------------------|----------------------|--|
| CONTENTS | SMART MENU/SET | | Hold | down the 👅 | button for | | | |
| INTRODUCTION | Hold down for 3 seconds | Out | | e seconds to s mode. | witch to the | | | |
| PREPARATION | | - | | - | | s and analog | output values | |
| FOR | (equivalent to | | | | , | | | |
| FLOW OF OPERATION | To specify any analog output value for a display value, assign the analog output range and the minimum and maximum analog output values by selecting the analog output and then setting up scaling. | | | | | | | |
| BASIC SETUP | (If scaling is i | not set up, the i | meas | urement range | is the same a | is the analog o | utput range.) | |
| Reality | 0 | 1 0 | | ned based on | the post-scali | ng display val | ue setting range | |
| MAIN APPLICATIONS & SETTING METHODS | Concerning t | | nd ma | | | - | | |
| Height | | ut for the small t maximum val | | | | | 2-AFT), and the | |
| Steps and Warpage | To only speci | fy the analog o | utput | range, withou | t changing disp | olay values | | |
| Double Sheet Detection | wh | set the analog nen using the Z 55 mm from the | X2-L[| D50(L) at a dis | | | | |
| Thickness | (1) Select - | 5,5⊬ as the | analo | og output settir | ıg. | _5 mm | 5 mm | |
| Positioning | AFT val | he measureme ues, and then the measured | assi | gn the analog | | | 5 V | |
| Eccentricity and Surface Deflection | | ⁼ : –5 (mm) ⁻ : –5 (mm) → S | et the | same value a | s S1-BEF | | | |
| DETAILED SETTINGS | • S2-BEF • S2-AF1 | ⁼ : 5 (mm) ⁻ : 5 (mm) → Se | t the s | same value as | S2-BEF | | | |
| TROUBLE- | <initial setting<="" th=""><th>g></th><th></th><th><scaling settir<="" th=""><th>ng></th><th></th><th></th></scaling></th></initial> | g> | | <scaling settir<="" th=""><th>ng></th><th></th><th></th></scaling> | ng> | | | |
| SHOOTING SPECIFI- | Display value | Analog output | | Scaling point | Pre-scaling display value (BEF) | Post-scaling display value (AFT) | Analog output | |
| CATIONS | –10 mm | –5 V | - | S1 | –5 mm | –5 mm | –5 V | |
| INDEX | 10 mm | 5 V | | S2 | 5 mm | 5 mm | 5 V | |
| | To specify the | e analog output | t rang | e after changi | ng display valu | ies | | |
| SETTING TRANSITION CHARTS | (For details | on scaling, se | e pag | je 108.) | | | | |

Output for Non-measurement | Setting channels used when connecting multiple units: Each CH

INTRODUCTION

MAIN APPLICATIONS & SETTING

METHODS Height

Steps and

Warpage Double

Sheet Detection

Thickness

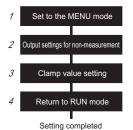
Output for non-measurement:

CONTENTS This refers to specifying the output contents when an error occurs (Error-dark or Error-bright), when a reset is being input, or before measured values are finalized.

(For details on these errors, see page 130.)

| Selection Menu | Output Contents | | | | |
|-------------------|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--|----------------------|--|
| Selection Menu | Judgment Output | Analog Output | | PREPARATION | |
| KEEP (Default) | The measurement value immediately before the non-measurement state is entered is all and output. | | | | |
| CLAMP | All OFF | The specified CLAMP value is output. The following options are available. • For voltage output: -5.00 to 5.00 V (in 1-V steps), or | | FLOW OF OPERATION | |
| | | the maximum (approximately 5.5 V) For current output: 4.00 to 20.00 mA (in 1-mA steps), or the maximum (approximately 22 mA) | | BASIC SETUP | |

Procedure for setting up output for non-measurement



Set to the MENU mode

| Button | Display | Description of Operation | Explanation of | Positioning |
|-------------------|----------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-------------------------------------------|
| Operation | Lit H L MENU | Hold down the button for three seconds to switch to the MENU mode. | Selection Menu | Eccentricity and Surface Deflection |
| Pres b daplay. | delai L | Press the & button to display dEERI L. | * This step is not required if detail menu display is already set to ON in the MENU mode. | SETTINGS TROUBLE- SHOOTING |
| Press to display. | <u>delai l</u> On | Press the 	 button to set the display to □N to set display of the detail menu. | | SPECIFI- CATIONS |
| SMART MENU/SET | | Press the button to apply the setting. | | SETTING TRANSITION |

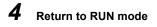
CHARTS

2 Output settings for non-measurement

| CONTENTS | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|---------------------|---------------------------|----------------------------------------------------------|------------------------------------------------------------|
| INTRODUCTION | Press to display | RSEDUE | Press the I button to display RSEDUE - | Default value: KEEP |
| PREPARATION For Measurement | | RSEQUE KEEP | Press the 💲 button to select output for non-measurement. | KEEP The measured value status before measurement is |
| FLOW OF OPERATION | Press to select | Select the desired value. | | stopped is held and output. |
| BASIC SETUP | | | | Analog output: The preset clamp value is output. |
| MAIN APPLICATIONS & SETTING METHODS | SMART MENU/SET | | Press the button to apply the setting. | |
| Height | - | | | |

3 Clamp value setting

| Steps | 3 Clam | o value setting | I | |
|-------------------------------------------|---------------------|---------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------|
| Warpage Double Sheet | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
| Detection | | | Press the 🕸 button to display | Default value: MAX |
| Thickness | Press to display | <u> </u> | CLAMP. | The clamp value is output |
| Positioning | | | | from when the power is turned on until the measured value is finalized, even when |
| Eccentricity and Surface Deflection | | | | KEEP is selected, so be sure to set this value. |
| DETAILED SETTINGS | | <u> </u> | Press the 💲 button to display the clamp value. | For voltage output: |
| TROUBLE- SHOOTING | Press to select | Select the desired value. | | MAX For current output: |
| SPECIFI- CATIONS | | | | In 1 mA units |
| INDEX | SMART MENU/SET | | Press the button to apply the setting. | |
| SETTING TRANSITION CHARTS | | | | |



| Button Operation | Display Description of Operation | | Explanation of Selection Menu | CONTENTS |
|----------------------------|----------------------------------|---------------------------------------------------------|----------------------------------|--------------|
| SMART MENU/SET | Out | Hold down the button for three seconds to switch to the | | CONTENTS |
| Hold down for 3 seconds | H L MENU | RUN mode. | | INTRODUCTION |

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

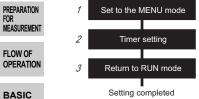
INDEX

Timer

CONTENTS Th

The timing for judgement outputs can be adjusted to match the operation of external devices. (Timer accuracy: Up to 1 ms)

NTRODUCTION Procedure for setting up the timer



1

BASIC SETUP

DETAILED

SETTINGS

MAIN

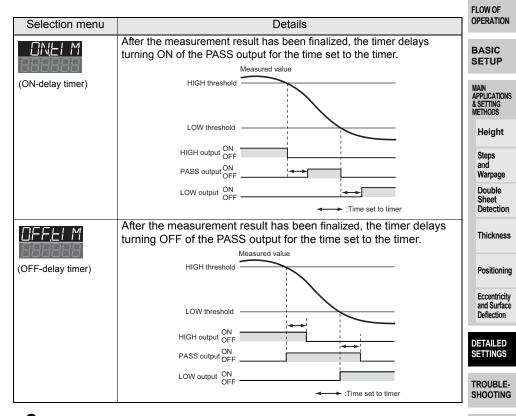
Set to the MENU mode

| APPLICATIONS & SETTING | Button | | | Explanation of |
|-------------------------------------------|----------------------------|--------------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| METHODS | Operation | Display | Description of Operation | Selection Menu |
| Height | SMART MENU/SET | Lit | Hold down the 🖱 button for | |
| Steps and Warpage | Hold down for 3 seconds | H L MENU | three seconds to switch to the MENU mode. | |
| Double Sheet Detection | Press to display. | <u>dELRI L</u> 888888 | Press the \$ button to display dELRI L. | * This step is not required if detail menu display is already set to ON in the MENU mode. |
| Positioning | | delai L On | Press the 拳 button to set the display to ☐N to set display of the detail menu. | |
| Eccentricity and Surface Deflection | Press to display. | | Press the to apply the setting. | |

2 Timer setting

| TROUBLE- SHOOTING | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|---------------------------------|---------------------|----------------|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| SPECIFI- CATIONS | Press to display, | Select the | Press the the button to display DNLI M when setting the ON- delay and DFFLI M when setting the OFF-delay. | ON-delay timer OFF-delay timer (For details, see the |
| INDEX | | desired value. | | following page.) |
| SETTING TRANSITION CHARTS | | | Press the sutton to enable setting of the timer. | |

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|------------------------|---------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-----------------------------------|
| [Change numeric value] | | Press the 👀 button to move | OMS to IOOOMS | |
| Move digit] | | the digit, press the substant to change the numeric value, and set the time set to the timer. | * If the \$ button is pressed when the cursor is at the right-most digit or the \$ | CONTENTS |
| Press to set. | | | button is pressed when the cursor is at the left-most digit, | INTRODUCTION |
| | | | the setting will be canceled. | |
| SMART MENU/SET | | Press the button to apply the setting. | | PREPARATION FOR MEASUREMENT |



3 Return to RUN mode

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | INDEX |
|----------------------------------------------|-----------------|-------------------------------------------------------------------|----------------------------------|---------------------------------|
| SMART MENU/SET Hold down for 3 seconds | Uut H L MENU | Hold down the button for three seconds to switch to the RUN mode. | | SETTING TRANSITION CHARTS |

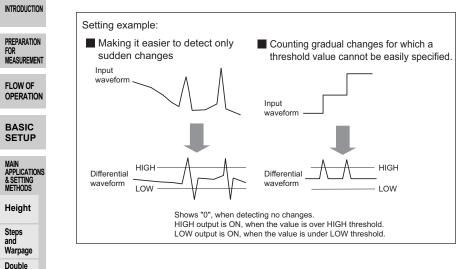
SPECIFI-CATIONS

Setting the Differential Function

Setting channels used when connecting multiple units: Each CH

Differential function:

This function is used to display measurement change amounts when it is difficult to specify a threshold for the measured value, making it easier to detect only sudden changes in the measured values.



· The detection effectiveness varies depending on the response time setting.

Description of Operation

Hold down the 👅 button for

three seconds to switch to the

MENU mode.

Procedure for setting up differential function

Set to the MENU mode

Differential function

setting

Return to RUN mode

Setting completed

Set to the MENU mode

Display

MENU

Important

1

2

3

1

Button

Operation

MENU/SET

Hold down for 3 seconds

Detection Thickness

Sheet

CONTENTS

- Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

116

Setting the Differential Function

Ч Ξ Explanation of

Selection Menu

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|---------------------|-------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----------------------------------|
| Press to display. | dELRI L 888888 | Press the I button to display dELRI L. | * This step is not required if detail menu display is already set to ON in the MENU mode. | CONTENTS |
| | delai L DN | Press the ♥ button to set the display to □N to set display of the detail menu. | | INTRODUCTION |
| Press to display. | | Press the button to apply | | PREPARATION FOR MEASUREMENT |
| | | the setting. | | FLOW OF OPERATION |

2 Differential function setting

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | SETUP | | |
|---------------------|-------------|-----------------------------------------------|----------------------------------|----------------------------------------------|--|--|
| Press to a | | Press the 🌢 button to display 네 FF . | | MAIN APPLICATIONS & SETTING METHODS | | |
| to display. | | | | Height | | |
| | di FF NN | Press the 拳 button to set the display to □N . | | Steps and Warpage | | |
| Press to display. | | | | Double Sheet Detection | | |
| SMART MENU/SET | | Press the button to apply the setting. | | Thickness | | |

3 Return to RUN mode

| SMART MENUSET Hold down the button for three seconds to switch to the | Button Operation | Eccentricity and Surface Deflection |
|-----------------------------------------------------------------------|---------------------|-------------------------------------------|
| Hild down for 3 seconds RUN mode. | Hold down for | DETAILED SETTINGS |

Positioning

SPECIFI-CATIONS

INDEX

External Input for Bank, Timing Input, Reset Input

Setting channels used when connecting multiple units: Each CH, Bank switching: CH1

External input:

This refers to inputting the bank switching signal, the timing signal during a hold and the reset signal from an external device to execute these operations.

PREPARATION FOR MEASUREMENT

CONTENTS

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Procedure for setting up external input Set to the MENU mode 1 2 External input terminal setting 3 Return to RUN mode Setting completed

Set to the MENU mode

| Steps and Warpage | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|-------------------------------------------|----------------------------------------------|----------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------|
| Double Sheet Detection | SMART MENU/SET Hold down for 3 seconds | Lit H L MENU | Hold down the button for three seconds to switch to the MENU mode. | |
| Thickness | P | dEE81 L | Press the 🕸 button to display | * This step is not required if |
| Positioning | Press to display. | | סבבחי ב. | detail menu display is already set to ON in the MENU mode. |
| Eccentricity and Surface Deflection | | <u>delai l</u> On | Press the ♥ button to set the display to □N to set display of the detail menu. | |
| DETAILED SETTINGS | Press to display. | | | |
| TROUBLE- SHOOTING | SMART MENU/SET | | Press the button to apply the setting. | |

Description of Operation

SPECIFI-CATIONS 2

Button

Operation

INDEX

SETTING TRANSITION CHARTS

External input terminal setting

Display

Explanation of

Selection Menu

Default value: TIM.RST

INTRODUCTION Note: When the mutual interference prevention function is being used, external input cannot be used.

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|---------------------|---------------------------------|-----------------------------------------------------------|---------------------------------------------------------------|-----------------------------------|
| Press to select | EXE-IN LI MRSE Select the | Press the 💲 button to select the external input terminal. | LI MRSE timing input/reset input BRNK Bank switching | CONTENTS |
| SMART MENU/SET | desired value. | Press the 👅 button to apply | | INTRODUCTION |
| | | the setting. | | PREPARATION FOR MEASUREMENT |

3 Return to RUN mode

| Button | Display | Description of Operation | Explanation of | OPERATION | |
|----------------------------|---------|--------------------------|--------------------------------|----------------|---------------------|
| Operation | | ay | | Selection Menu | BASIC |
| SMART MENU/SET | | Out | Hold down the 🖱 button for | | SETUP |
| | | | three seconds to switch to the | | |
| Hold down for 3 seconds | ΗL | MENU | RUN mode. | | MAIN APPLICATION |

Procedure for executing external input

Each of the functions is executed when signals are input using the external input wire in table 1 below.

Timing input, reset input and bank switching are executed by a signal input of 4 ms or more. While the signal in table 2 below is being input, measurement is performed based on the settings of the specified bank.

When connecting two or more Amplifier Units, use the CH1 Amplifier Unit for bank switching. The banks of the Amplifier Units of CH2 and later are switched together with CH1.

Table 1 External Input Wiring

| Amplifier Unit Connector Cable Color Setting | Purple | Red |
|-------------------------------------------------------|--------------|--------------|
| EI MRSE | Timing input | Reset input |
| 6ANK | BANK input 0 | BANK input 1 |

Table 2 Bank Signal Switching Wiring

| | BANK Input 0 (purple) | BANK Input 1 (red) |
|--------|--------------------------|-----------------------|
| BANK 0 | OFF | OFF |
| BANK 1 | ON | OFF |
| BANK 2 | OFF | ON |
| BANK 3 | ON | ON |

Bank signal switching is enabled only in the RUN mode. Note:

NS METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Setting the Detection Surface Selection

Setting channels used when connecting multiple units: Each CH

Measurement performed with

correct reflection components

(with the MAX setting)

Detection surface selection:

Sensor Head

Measurement

while moving

Correct reflection --- Multireflection

The default value is FIRST. Setting the value to MAX can decrease incorrect measurements caused by diffused reflection or multireflection due to the shape of the workpiece.

Correct

Measurement performed on

(with the FIRST setting)

Multireflection

the NEAR side

NEAR

Procedure for setting up detection surface selection

reflection

FAR

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Heiaht

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Set to the MENU mode

| Eccentricity and Surface | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|------------------------------------|----------------------------------------------|----------------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| Deflection DETAILED SETTINGS | SMART MENU/SET Hold down for 3 seconds | Lit H L MENU | Hold down the button for three seconds to switch to the MENU mode. | |
| TROUBLE- SHOOTING | Press to display. | dELRI L 888888 | Press the 🌢 button to display dEERL | * This step is not required if detail menu display is already set to ON in the MENU mode. |
| SPECIFI- CATIONS | Press to display. | <u>delri l</u> On | Press the 拳 button to set the display to ☐N to set display of the detail menu. | |
| SETTING TRANSITION | SMART MENU/SET | | Press the button to apply the setting. | - |

CHARTS

120

Detection surface 2 selection setting 3 Return to RUN mode Setting completed

Set to the MENU mode

2 Detection surface selection setting

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | _ |
|-----------------------------|---------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Press to display, | <u>dELECL</u> 888888 | Press the 🌢 button to display dELEEL . | | |
| Press to select | Select the desired value. | Press the 	 button to display MRX. | FIRSE During normal measurement MRX When an incorrect measurement occurs due to diffused reflection or multireflection | PREPARATION FOR MEASUREMENT FLOW OF OPERATION |
| SMART MENU/SET | | Press the button to apply the setting. | | BASIC SETUP |
| 3 Return to RUN mode | | | | |

3 Return to RUN mode

| | Button | Diard | | Description of Opportunity | Explanation of | Height |
|---|----------------------------|------------|-------------|------------------------------------------|----------------|------------------------------|
| - | Operation | Displ | ay | Description of Operation | Selection Menu | Steps and |
| s | MART MENU/SET | | | Hold down the 👅 button for | | Warpage |
| (| Hold down for 3 seconds | □ □ H L | Out MENU | three seconds to switch to the RUN mode. | | Double Sheet Detection |

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Key Lock Function

CONTENTS

Key Lock Function:

CONTENTS The key lock function disables all keys. Once keys have been disabled, no key input will be accepted until the lock is released. This function is useful for preventing inadvertent changes to settings.

(Although button operations are disabled, external input is still possible.)

PREPARATION FOR MEASUREMENT Key Lock Function

FLOW OF OPERATION

BASIC SETUP

MAIN

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

| = ION | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------|--------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------|-------------------------------|
| ; | Hdd bein dawn fe 3 second 1 second Hdd bein dawn fe 3 second | 888888 K-LOCK | Hold both the (a) buttons down for three seconds in the RUN mode. | |

Canceling the Key Lock

| ige | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|------------|---------------------|-----------------------------------------------|--------------------------------------------------------------------|----------------------------------|
| le tion | Hdd berh do | | Hold both the (**) buttons down for three seconds in the RUN mode. | |
| ess | s n fr | Displayed until completion of cancellation | | |

Initializing Settings Data Setting channels used when connecting multiple units: Each CH

Initialization: This function resets all settings to their default values.

Default Values

| Function | Default Value | INTRODUCTION |
|---------------------------------|------------------------------------------|-----------------------------|
| Display | 0 reference: Measurement center distance | |
| | + indication: NEAR side | PREPARATION FOR |
| | - indication: FAR side | MEASUREMENT |
| HIGH threshold | Measurement range maximum value | FLOW OF |
| LOW threshold | Measurement range minimum value | OPERATION |
| Response time | 500 ms | D.4.010 |
| Analog output setting | –5 to +5 V | BASIC SETUP |
| Detail menu display selection | OFF | MAIN |
| Bank switching settings | 0 | & SETTING METHODS |
| Mutual interference prevention | OFF | Height |
| Hysteresis width | 0.000 | Steps and |
| Two-Sensor operation | OFF | Warpage |
| setting | | Double Sheet |
| Thickness setting | 0.000 | Detection |
| Measured value display scaling | OFF | Thickness |
| Differential function | OFF | Positioning |
| Hold setting | OFF | _ |
| Trigger mode | TIMING (self-trigger timing input) | Eccentricity and Surface |
| Self-trigger level | 0.000 | Deflection |
| Output for non- measurement | KEEP | DETAILED SETTINGS |
| Clamp value | MAX | |
| ON-delay time | 0 ms | TROUBLE- SHOOTING |
| OFF-delay time | 0 ms | |
| Zero reset memory | OFF | SPECIFI- CATIONS |
| Display during zero reset | 0.000 | |
| External input terminal setting | TIM.RST (timing input/reset input) | |
| Detection surface selection | FIRST | TRANSITION CHARTS |

Procedure for initializing settings data



Important

1

PREPARATION FOR MEASUREMENT

FLOW OF

Steps and

OPERATION

 When connecting two or more Amplifier Units, use CH1 to perform initialization because CH2 and later channels cannot be used to do this.

Note that CH2 and later channels are initialized together with CH1.

Set to the MENU mode

| BASIC SETUP | Button Operation | Display | Description of Operation | Explanation of Selection Menu |
|----------------------------------------------|---------------------|-----------------|--------------------------------------------------------------------------|-------------------------------|
| MAIN APPLICATIONS & SETTING METHODS | SMART MENU/SET | Lit H L MENU | Hold down the button for three seconds to switch to the MENU mode. | |
| Height | 3 seconds | | MENU Mode. | |

2 Setting data initialization

| Warnana | | | | | | |
|-------------------------------------------|---------------------|--------------------------------|---------------------------------------------------------------------|----------------------------------|--|--|
| Warpage Double Sheet Detection | Button Operation | Display | Description of Operation | Explanation of Selection Menu | | |
| Thickness | Press to deplay | <u> NI E</u> 888888 | Press the I button to display | | | |
| Positioning | × | | - | | | |
| Eccentricity and Surface Deflection | Press to display. | EXE | Press the \Leftrightarrow button to display $E \times E$. | | | |
| DETAILED SETTINGS | SMART MENU/SET | <u> N E</u> | Press the 🖱 button. | | | |
| TROUBLE- Shooting | HORE GOWIT | Displayed 1 digit at a time | | | | |
| SPECIFI- CATIONS | | I NI E | When 🛛 🕂 is displayed, this means that initialization is completed. | | | |
| INDEX | | | P | L | | |

SETTING

TRANSITION CHARTS

3 Return to RUN mode

| Button Operation | Display | Description of Operation | Explanation of Selection Menu | |
|----------------------------|----------|---------------------------------------------------------|----------------------------------|--------------|
| SMART MENU/SET | | Hold down the button for three seconds to switch to the | | CONTENTS |
| Hold down for 3 seconds | H L MENU | RUN mode. | | INTRODUCTION |

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

CONTENTS

INTRODUCTION

PREPARATION For Measurement

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

TROUBLESHOOTING

| Troubleshooting | 128 |
|-----------------|-----|
| Error Messages | 130 |
| Q&A | 133 |

Troubleshooting

CONTENTS

This section describes countermeasures for temporary hardware problems. Check the malfunction in this section before sending the hardware for repair.

| INTRODUCTION | Category | Problem | Probable cause and possible countermeasure | Pages |
|----------------------------------------------------------|-----------|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| PREPARATION | | The device restarts during operation. | Is the power supply device connected correctly? Are the Calculating Units connected correctly? | p.30 p.26 |
| MEASUREMENT | | No input signal is received. | Are all cables connected correctly?Is the input signal line disconnected? | p.30 |
| OPERATION | | The measured values fluctuate and are not stable | This problem may be due to temperature characteristics. Execute zero reset periodically using | p.101 |
| BASIC SETUP | Operation | depending on day and time. | the standard object to correct this problem. | |
| MAIN | pera | Laser light is not emitted. | Is the LD-OFF input short-circuited? | p.30 |
| APPLICATIONS & SETTING METHODS | ō | Bank switching by signals from the external input terminal is not functioning. | Is the external input terminal set to <u>LANK</u>? Is the cable connected correctly? | p.118 p.30 |
| Height | | The state returns to | • Is the external input terminal set to 21 MR52? | p.118 |
| Steps and Warpage Double | | bRNK ☐ in the RUN mode even if after a bank is switched by button | | |
| Sheet Detection | | operation. The main display stays at | Has a timing input been made while hold is enabled | p.93 |
| Thickness | | []. | and the trigger mode is <i>L M N C</i>? If the hold function is enabled and the trigger type is <i>SELF-U</i> or <i>SELF-d</i>, has the self-trigger level been set to an appropriate value? | p.95 |
| Positioning Eccentricity and Surface Deflection | splay | An abnormal distance is displayed when the object is clearly outside the measurement range. | This problem may occur due to the characteristics of the sensor. Make sure that the distance to the sensing object is appropriate. | _ |
| DETAILED SETTINGS | | Display | LddlWN is displayed on the sub-display when the power is turned ON. | The laser of the Sensor Head has deteriorated. Replace the Sensor Head. |
| TROUBLE- SHOOTING | Ω | Ld∏FF is displayed on the sub-display. | Is the LD-OFF input short-circuited? | p.30 |
| SPECIFI- | | LI MI N⊑ is displayed on the sub-display. | Is the timing input short-circuited? | p.30 |
| CATIONS | | RESEL is displayed on the sub-display. | Is the reset input short-circuited? | p.30 |
| INDEX | | Even though the installation conditions are | Is the zero-reset input short-circuited? | p.30 |
| SETTING TRANSITION CHARTS | | the same, measured values differ considerably. | | |

| Category | Problem | Probable cause and possible countermeasure | Pages | |
|----------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------|
| olay | E - BRGE is displayed on the main display | Is the distance between the Sensor Head and the workpiece within the measurement range? | p.139 | CONTENTS |
| Display | E - dRK is displayed on the main display. | Is the distance between the Sensor Head and the workpiece within the measurement range? | p.139 | 1 |
| | Judgements are not output to external devices. | Are all cables connected correctly?Is the output signal line disconnected? | p.30 | INTRODUCTION |
| Output | | Is the reset input short-circuited? Is the HIGH threshold set to a value larger than the LOW threshold? | | PREPARATION FOR MEASUREMENT |
| | Analog output levels are strange. | Are the analog output settings correct? | p.109 | FLOW OF OPERATION |

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

Error Messages

CONTENTS

This section outlines the error messages displayed on the Amplifier Unit and the countermeasures for those messages. While displaying an error, the error output signal is also output. (There are some

| INTRODUCTION | | | |
|---------------------------|---------------|------------------------------------------------------|---------------------------------------------------------|
| | Display | Error | Countermeasure |
| PREPARATION | Error-bright | Saturated light amount intensity, | Install so that the distance between |
| FOR MEASUREMENT | <u>E-6865</u> | measurement error. | the Sensor Head and the |
| MERGONEMENT | 888888 | (The error output signal is not output.) | workpiece is within the |
| FLOW OF | | | measurement range. |
| OPERATION | Error-channel | There is only one Amplifier Unit | If two or more Amplifier Units have |
| | E-CH | even though mutual interference | been installed, turn OFF the power |
| BASIC | | prevention is set to ON. | supply and check that the Amplifier |
| SETUP | | There is only one Amplifier Unit | Units and Calculating Units are |
| | | even though two-Sensor operation | connected correctly. |
| MAIN APPLICATIONS | | is set to ON. | If only one Amplifier Unit is being |
| & SETTING METHODS | Error-channel | Two Amplifier Unit communication | used, connect another Amplifier |
| | E-CH | error. | Unit temporarily and turn OFF |
| Height | 50 | | mutual interference prevention and |
| Steps | | | two-Sensor operation, or initialize |
| and | | | the setting data. |
| Warpage | Error-dark | Insufficient received light intensity, | Install so that the distance between |
| Double Sheet | E-988K | measurement error. | the Sensor Head and the |
| Detection | 888888 | (The error output signal is not output.) | |
| | | | measurement range. |
| Thickness | Error-head | The Sensor Head is disconnected. | Turn OFF the power supply, check |
| | <u>E-HERd</u> | Or, a sensor communications error | the Sensor Head connection, and |
| Positioning | COMO I | has occurred. | then turn ON the power supply |
| rosidoning | Error-head | | again. |
| Eccentricity | E-HERd | | If the above countermeasure does |
| and Surface Deflection | 50M03 | | not solve the problem, the Sensor |
| Denection | Error-head | | Head is malfunctioning. Replace the Sensor Head. |
| DETAILED | E-HERd | | the Sensor Head. |
| SETTINGS | E0M03 | | |
| | Error-head | Sensor Head laser error. | |
| TROUBLE- | E-HE8d | | |
| SHOOTING | LdO I | | |
| | Error-head | The Sensor Head internal memory is | |

INTRODUCTION

exceptions.)

130

SPECIFI-

CATIONS

INDEX

SETTING TRANSITION CHARTS

E-HERd

MEMOT Error-head

> E-HERd MEMO2

in error.

| Display | Error | | Countermeasure | |
|---------------------------------------|---------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| Error-head <u>E-HERd</u> SYSD 1 | Sensor Head system error. | • | Turn OFF the power supply, check the Sensor Head connection, and then turn ON the power supply | |
| Error-head | | • | again. If the above countermeasure does | CONTENTS |
| Error-head | | | not solve the problem, the Sensor Head is malfunctioning. Replace the Sensor Head. | INTRODUCTION |
| <u>E-KERd</u> 53503 | | | | PREPARATION FOR |
| Error-head | Because the Sensor Head version is | • | Contact the company with which | MEASUREMENT |
| <u>E-HERA</u> VER | old, the connected Amplifier Unit cannot be used. | | your company is doing business or the OMRON sales representative handling your company. | FLOW OF OPERATION |
| Error-memory | Amplifier Unit setting memory error. | • | Turn OFF the power supply, check if wiring is connected correctly, and then turn ON the power supply | BASIC SETUP |
| | | • | again. If the above countermeasure does not solve the problem, the | MAIN APPLICATIONS & SETTING METHODS |
| | | | Amplifier Unit is malfunctioning. Replace the Amplifier Unit. | Height |
| Error-memory E-MEM | Amplifier Unit setting memory error. | • | Initialize the settings by holding down the SET key for at least three seconds. | Steps and Warpage |
| | | • | If the above countermeasure does not solve the problem, the | Double Sheet Detection |
| | | | Amplifier Unit is malfunctioning. Replace the Amplifier Unit. | Thickness |
| Error-short | One or all of the judgment outputs are short-circuited. | • | Turn OFF the power supply, check that the HIGH, PASS, LOW or error output lines are not short- | Positioning |
| | | | circuited, then turn ON the power supply again. | Eccentricity and Surface Deflection |
| Error-system | Amplifier Unit system error. | • | Turn OFF the power supply, check if wiring is connected correctly, and then turn ON the power supply again. | DETAILED SETTINGS |
| | | • | If the above countermeasure does not solve the problem, the Amplifier Unit is malfunctioning. Replace the Amplifier Unit. | TROUBLE- SHOOTING |
| Tuning-failed | Smart Tuning failed. | • | Change the response time setting | SPECIFI- CATIONS |
| <u>EUN ING</u> FR ILEd | (The error output signal is not output.) | • | to a larger value, and try again. Make sure that the distance between the Sensor and | INDEX |
| | | | Workpiece is within the measurement range, and try again. | SETTING TRANSITION CHARTS |

| | Display | Error | Countermeasure |
|----------------------------------------------|---------------|------------------------------------------------------------------------|------------------------------------|
| | LD.down | The laser of the Sensor Head has | Replace the Sensor Head. |
| | 888888 | deteriorated. | |
| | LddOwn | | |
| CONTENTS | | Measured values are not output | Normally, measured values are |
| | 888888 | because the reset signal is being input, calculations are in progress, | displayed once they can be output. |
| INTRODUCTION | | timing is before the hold sampling | |
| | | time, etc. | |
| PREPARATION | | (The error output signal is not output.) | |
| FOR MEASUREMENT | | | |
| WEAJUKEWENT | | | |
| FLOW OF | | | |
| OPERATION | | | |
| | | | |
| BASIC SETUP | | | |
| 52151 | | | |
| | | | |
| MAIN APPLICATIONS & SETTING METHODS | | | |
| | | | |
| Height | | | |
| Steps | | | |
| Steps and Warpage | | | |
| Double | | | |
| Sheet | | | |
| Detection | | | |
| Thickness | | | |
| | | | |
| Desitioning | | | |
| Positioning | | | |
| Eccentricity | | | |
| and Surface Deflection | | | |
| | | | |
| DETAILED | | | |
| SETTINGS | | | |
| | | | |
| TROUBLE- SHOOTING | | | |
| onconing | | | |
| SPECIFI- | | | |
| CATIONS | | | |
| | | | |
| INDEX | | | |
| | | | |
| SETTING | | | |
| TRANSITION | | | |
| GHARIS | | | |
| | | | |
| 132 | Error Message | 25 | ZX2 User's Manual |

| Question | Answer | CONTENTS | |
|-------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--|
| What is the positional variation range with | The range is $\pm 0.5^{\circ}$ of the ideal emitter axis in | | |
| respect to the machine axis of the emitter beam spot? | the dimensional drawing on page 138. | INTRODUCTION | |
| After the response time is changed, is it necessary to re-execute smart tuning? | Yes. After the response time is changed, the smart tuning results are cleared. Therefore, re-execute tuning. | PREPARATION FOR MEASUREMENT | |
| If using a different bank for the first time, is it necessary to execute smart tuning? | e, is it Yes. The smart tuning results are not applied to other banks. If using a different bank for the first time, execute smart tuning. | | |
| For the line beam type, is it possible to detect beam-spot-internal steps? | Spot-internal steps cannot be measured. Use the line beam spot so that it is at only one height. | BASIC SETUP | |
| Is it possible to add additional extension cables between the Sensor Head and Amplifier Unit? | Regardless of the length, only one extension cable can be added. It is not possible to add multiple extension cables. | MAIN APPLICATIONS & SETTING METHODS | |
| About how much signal input and open time is required for each input operation? | These times can be checked using the timing charts in this manual (on page 144). | Height | |
| Can calculations be performed when Sensor Heads that have different measurement | Yes. This is possible without specifying any special settings. | Steps and Warpage | |
| ranges are connected to two Amplifier Units? How can I prevent an incorrect value being measured and output due to the shape of the | If the incorrect measurement is caused by multireflection due to the shape of the | Double Sheet Detection | |
| workpiece? | workpiece, setting the detection surface selection to MAX might improve the | Thickness | |
| Does the sensor need to be warmed up after canceling LD-OFF input? | measurement accuracy. (See page 120.) Yes. The sensor must be warmed up for at least 10 minutes in the same way as when | Positioning | |
| Can the sensor head of a diffuse-reflective | turning on the power. | Eccentricity and Surface Deflection | |
| model be tilted like that of a regular-reflective model? | Yes it can, but because the sensor is tilted, the actual measurement distance between the sensor and the workpiece will differ from the distance displayed. | DETAILED | |
| | In this case, use a regular-reflective model whose linearity has been optimized by using regular-reflective optics. | TROUBLE- SHOOTING | |

SPECIFI-CATIONS

INDEX

CONTENTS

INTRODUCTION PREPARATION For Measurement FLOW OF OPERATION BASIC SETUP MAIN APPLICATIONS & SETTING METHODS Height Steps and Warpage Double Sheet Detection Thickness Positioning Eccentricity and Surface Deflection DETAILED SETTINGS TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

SPECIFICATIONS

| Specifications and Dimensions | 136 |
|------------------------------------|-----|
| Timing Charts | 144 |
| Engineering Data (Reference Value) | 147 |

Specifications and Dimensions

Amplifier Units CONTENTS ZX2-LDA11/LDA41 INTRODUCTION (Unit: mm) PREPARATION FOR MEASUREMENT 11.7 8 E FLOW OF OPERATION Vinvl insulated round cable 5.2 dia., 11 conductors (Conductor cross-section 0.09 mm²/ Insulator diameter: 0.7 mm) Note: The analog output line (black) BASIC has double shielding and SETUP 72 (cover open, 84.6) 6.2 the diameter of the insulator is 2.3 mm 30 Standard length: 2 m Minimum bending radius: 30 mm 47.6 4.2 MAIN APPLICATIONS & SETTING METHODS в 9.6 56) 6 38.4 (cover open, 5 Height 34.2 16.6 Steps and 16.9 Warpage ₹-Double 20.7 36.8 Sheet 10.9 15.4 6.1 Detection * Min. length when connected: 50 Thickness

50 mm

E

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

| Model Item | ZX2-LDA11 | ZX2-LDA41 | | |
|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--|
| Measurement period (*1) | Min. 30 µs | | | |
| Response time | 60 μs, 120 μs, 240 μs, 500 μs, 1 ms, 2 ms, 4 ms, 8 ms, 12 ms, 20 ms, 36 ms, 66 ms, 128 ms, 250 ms, 500 ms | | | |
| Analog output (*3) | 4 to 20 mA, Max. load resistance: 300 Ω , ±5 Output impedance: 100 Ω | VDC or 1 to 5 VDC, | INTRODUCTI | |
| Judgment outputs (HIGH/PASS/ LOW: 3 outputs), error output | NPN open-collector outputs, 30 VDC, 50 mA max. fesidual voltage: 1 V max. for load current 10 mA max., 2 V max. for load current | PNP open-collector outputs, 30 VDC, 50 mA max. residual voltage: 1 V max. for load current 10 mA max., 2 V max. for load current | PREPARATIO FOR MEASUREME FLOW OF | |
| Laser OFF input, zero reset input, timing input, reset input, bank input (*2) | Above 10 mA ON: Short-circuited with 0-V terminal or 1.2 V or less. OFF: Open (leakage current: 0.1 mA max.) | C above 10 mA J ON: Supply voltage short-circuited or supply voltage within –1.2 V OFF: Open (leakage current: 0.1 mA max.) | BASIC SETUP | |
| Functions | Smart tuning, scaling, sample hold, peak hold, bottom hold, peak-to-peak hold, self-peak hold, self-bottom hold, average hold, zero reset, On-delay timer, OFF-delay timer, keep/clamp switch, (A-B) calculations (*4), thickness calculation (*4), mutual interference prevention (*2)(*4), laser deterioration detection, bank function (4 banks), differential function | | | |
| Indications | Judgement indicators: HIGH (orange), PASS (green), LOW (orange),11-segment main display (red), 11-segment sub-display (orange), laser ON (green), zero reset (green), ENABLE (green), MENU (green), HIGH threshold (orange), LOW threshold (orange) | | | |
| Power supply voltage | 10 to 30 VDC, including 10% ripple(p-p) | | | |
| Power consumption | 3,000 mW max. (at 24 VDC: 125 mA max., at 12 VDC: 250 mA max.) | | | |
| Ambient temperature | Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation) | | | |
| Ambient humidity | Operating and storage: 35% to 85% (with no condensation) | | | |
| Dielectric strength Vibration resistance (destruction) | 1,000 VAC, 50/60 Hz for 1 minute 10 to 150 Hz, 0.7-mm double amplitude, 80 minutes each in X, Y, and Z directions | | | |
| Shock resistance (destruction) | 300 m/s ² 3 times each in six directions (up/down, left/right, forward/backward) | | | |
| Degree of protection | IEC60529, IP40 | | | |
| Connection method | Prewired (standard cable length: 2 m) | | | |
| Weight (packed state) | Approx. 200 g (main unit only: approx. 135 g) | | | |
| Materials | Case: PBT (polybutylene terephthalate), Cover: Polycarbonate, Display: Acrylic resin, Buttons: Polyacetal, Cable: PVC | | | |
| Accessories | Instruction sheet | | CATION | |

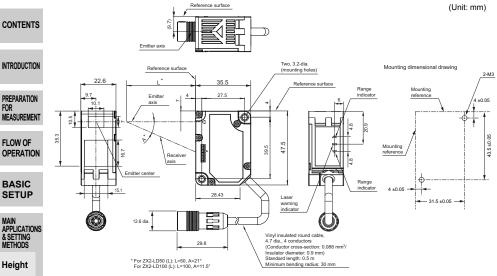
(*2) External input and the mutual interference prevention function cannot be used at the same time.

(*3) In the MENU mode, select and set current output (4 to 20 mA) and voltage output (±5 V or 1 to 5 V).

(*4) A Calculating Unit (ZX2-CAL) is required. Mutual interference prevention is possible for up to five Amplifier Units, and calculations are possible for up to two.

Sensor Heads

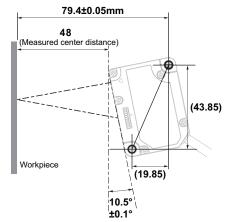
ZX2-LD50/LD50L, ZX2-LD100/LD100L, ZX2-LD50V



Setting Up the Regular-reflective Model

Tilt the regular-reflective model as shown below with respect to the workpiece. See page 141 if attaching a bracket to tilt the regular-reflective model.

ZX2-LD50V



Adjust the installation so that the angle is 10.5° ±0.1°. *The mounting hole dimensions in parentheses (reference values) are for when the Sensor is installed at 10.5°.

Positioning

Thickness

Steps and

Sheet Detection

Warpage Double

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

| Model Item | ZX2-LD50L | ZX2-LD50 | ZX2-LD100L | ZX2-LD100 | |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------|--------------------------------------|
| Optical system | Diffuse-reflective | Diffuse-reflective | | | |
| Light source | Visible-light semiconductor laser with a wavelength of 660 nm and an output of 1 mW max. | | | | |
| (wave length) | EN class 2, FDA class | 2 (*5) | | | CONTENTS |
| Measurement center distance | 50 mm | | 100 mm | | |
| Measurement range | ±10 mm | | ±35 mm | | INTRODUCTION |
| Beam shape | Line | Spot | Line | Spot | |
| Beam size (*1) | Approx. 60 µm x 2.6 mm | Approx. 60 µm dia. | Approx. 110 µm x 2.7 mm | Approx. 110 µm dia. | PREPARATION FOR |
| Resolution (*2) | 1.5 µm | • | 5 µm | | MEASUREMENT |
| Linearity (*3) | ±0.05% F.S. (40 to 50 mm) | ±0.1% F.S. (40 to 50 mm) | ±0.05% F.S. (65 to 100 mm) | ±0.1% F.S. (65 to 100 mm) | FLOW OF |
| | ±0.1% F.S. (entire range) | ±0.15% F.S. (entire range) | ±0.1% F.S. (entire range) | ±0.15% F.S. (entire range) | OPERATION |
| Temperature characteristic (*4) | 0.02% F.S./°C | | | | BASIC SETUP |
| Ambient illumination | Incandescent lamp: 10,000 lx max. (on light receiving side) | | | | MAIN |
| Ambient temperature | Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation) | | | | APPLICATIONS & SETTING METHODS |
| Ambient humidity | Operating and storage: 35% to 85% (with no condensation) | | | | Height |
| Dielectric strength | 1,000 VAC, 50/60 Hz for 1 minute | | | | |
| Vibration resistance (destruction) | 10 to 150 Hz, 0.7-mm double amplitude, 80 minutes each in X, Y, and Z directions | | | | Steps and Warpage |
| Shock resistance (destruction) | 300 m/s ² 3 times each in six directions (up/down, left/right, forward/backward) | | | | Double |
| Degree of protection | IEC60529, IP67 | | | | Detection |
| Connection method | Connector connection (standard cable length: 500 mm) | | | | Thickness |
| Weight (packed state) | Approx. 160 g (main unit only: approx. 75 g) | | | | Positioning |
| Materials | Case and cover: Polybutylene terephthalate, Optical window: Glass, Screw sections: Brass, Cable: PVC | | | | Eccentricity |
| Accessories | Instruction sheet, ferrite core x 1 (made by TDK Corp. ZCAT1730-0730A), laser warning label (English), FDA certification label | | | | and Surface Deflection |

(Note) Highly reflective objects can result in incorrect detection by causing out-of-range measurements.

(*1) Beam size: The beam size is defined by 1/e² (13.5%) of the strength of the beam at the beam center (measured value).
 Incorrect detection may occur if there is light leakage outside the defined spot and the material around

 the sensing object is more reflective than the sensing object.
 (*2) Resolution: The resolution is the deviation (±3\circ) in the analog output when connected to the ZX2-LDA Amplifier Unit. (The resolution is measured with the standard reference object (white ceramic), at the measurement point when the response time of the ZX2-LDA is set to 128 ms.) The resolution is given at the repeat accuracy for a stationary workpiece, and is not an indication of the distance accuracy. The resolution may be adversely affected under strong electromagnetic fields.

The resolution may be adversely affected under strong electromagnetic fields. (*3) Linearity: The linearity is given as the error in an ideal straight line displacement output when measuring

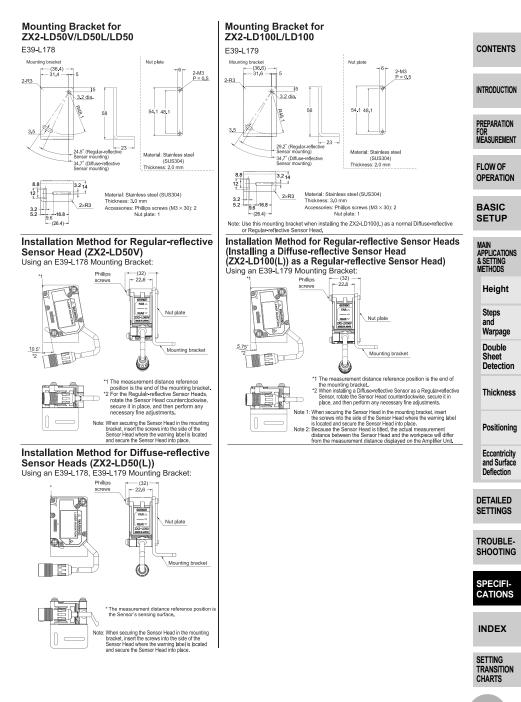
- (3) Linearity. The linearity is given as the error in an ideal straight line displacement output when measuring the standard reference object. The linearity and measurement values vary with the object being measured. F.S. is the entire measurement range. (ZX2-LD50D:20mm)
- (*4) Temperature characteristic: The temperature characteristic is measured at the measurement center distance with the Sensor and reference object (OMRON's standard reference object) secured with an aluminum jig.
- (*5) Categorized as Class 2 by IEC60825-1 criteria in accordance with the stipulations of the FDA standard Laser Notice No. 50, and registered with CDRH (Center for Devices and Radiological Health) (accession number: 1020665)

SETTING TRANSITION CHARTS

INDEX

| | Model Item | ZX2-LD50V | | |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| | Optical system | Regular-reflective | | |
| CONTENTS | Light source (wave length) | Visible-light semiconductor laser with a wavelength of 660 nm and an output of 0.24 mW max. | | |
| | | EN class 1, FDA class 1 (*5) | | |
| INTRODUCTION | Measurement center distance | 48 mm | | |
| PREPARATION | Measurement range | ±5 mm | | |
| FOR MEASUREMENT | Beam shape | Spot | | |
| | Beam size (*1) | Approx. 60 µm | | |
| FLOW OF | Resolution (*2) | 1.5 μm | | |
| OPERATION | Linearity (*3) | ±0.3% F.S. (entire range) | | |
| BASIC | Temperature characteristic (*4) | 0.06% F.S./°C | | |
| SETUP | Ambient illumination | Incandescent lamp: 10,000 lx max. (on light receiving side) | | |
| MAIN APPLICATIONS & SETTING | Ambient temperature | Operating: 0 to +50°C, Storage: -15 to +70°C (with no icing or condensation) | | |
| METHODS | Ambient humidity | Operating and storage: 35% to 85% (with no condensation) | | |
| Height | Dielectric strength | 1,000 VAC, 50/60 Hz for 1 minute | | |
| Steps and | Vibration 10 to 150 Hz, 0.7-mm double amplitude, 80 minutes each in X, Y, and Z directions (destruction) | | | |
| Warpage Double | Shock resistance (destruction) | 300 m/s ² 3 times each in six directions (up/down, left/right, forward/backward) | | |
| Sheet Detection | Degree of protection | IEC60529, IP67 | | |
| Thickness | Connection method | Connector connection (standard cable length: 500 mm) | | |
| | Weight (packed state) | Approx. 160 g (main unit only: approx. 75 g) | | |
| Positioning | Materials | Case and cover: Polybutylene terephthalate, Optical window: Glass, Screw sections: Brass, Cable: PVC | | |
| Eccentricity and Surface Deflection | Accessories | Instruction sheet, ferrite core \times 1 (made by TDK Corp. ZCAT1730-0730A), laser warning label (English), FDA certification label | | |
| DETAILED SETTINGS | (*1) Beam size: (measured) | | | |
| TROUBLE- | the sensing | tection may occur if there is light leakage outside the defined spot and the material around object is more reflective than the sensing object. The resolution is the deviation ($\pm 3\sigma$) in the analog output when connected to the ZX2-LDA | | |
| SHOOTING | Amplifier Ur measureme | nit. (The resolution is measured with the standard reference object (1/4 λ flat mirror), at the ent point when the response time of the ZX2-LDA is set to 128 ms.) ion is given at the repeat accuracy for a stationary workpiece, and is not an indication of the | | |
| SPECIFI- CATIONS | distance ac The resoluti | curacy. ion may be adversely affected under strong electromagnetic fields. | | |
| INDEX | the standard The linearit | he linearity is given as the error in an ideal straight line displacement output when measuring d reference object. Ity and measurement values vary with the object being measured. F.S. is the entire | | |
| INDEX | | e characteristic: The temperature characteristic is measured at the measurement center distance | | |
| SETTING TRANSITION CHARTS | (*5) Categorized | Isor and reference object (OMRON's standard reference object) secured with an aluminum jig. as Class 1 by IEC60825-1 criteria in accordance with the stipulations of the FDA standard e No. 50, and registered with CDRH (Center for Devices and Radiological Health) (accession 20665) | | |
| | | | | |
| 140 | Specificatio | ns and Dimensions ZX2 User's Manual | | |

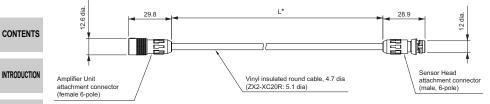
Mounting Bracket



Sensor Head Extension Cables

ZX2-XC1R, ZX2-XC4R, ZX2-XC9R, ZX2-XC20R

(Unit: mm)



PREPARATION FOR MEASUREMENT

*L Cable lengths: ZX2-XC1R: 1 m, ZX2-XC4R: 4 m, ZX2-XC9R: 9 m, ZX2-XC20R: 20 m

Note. Two or more extension cables cannot be connected in series.

| FLOW OF OPERATION | Model Item | ZX2-XC1R | ZX2-XC4R | ZX2-XC9R | ZX2-XC20R | |
|--------------------------------------|-----------------------------------|--------------------------------------------------------|---------------|---------------|----------------|--|
| | Cable type | Flex-resistance type | | | | |
| | Degree of protection | IP67 | | | | |
| BASIC SETUP | Dielectric strength (connector) | No flashover and no breakdown at AC 300 V for 1 minute | | | | |
| | Insulation resistance (connector) | 1000 MΩ min. (at 100 VDC) | | | | |
| MAIN | Weight (packed state) | Approx. 70 g | Approx. 450 g | Approx. 600 g | Approx. 1050 g | |
| APPLICATIONS & SETTING METHODS | Materials | Connector: PPS and PBT, Cable: PVC | | | | |
| | Minimum bend radius | 30 mm | | | | |
| Height | Accessories | Ferrite core x 2 (made by TDK Corp. ZCAT1730-0730A) | | | | |
| | | | | | | |

Steps and Warpage

Height

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

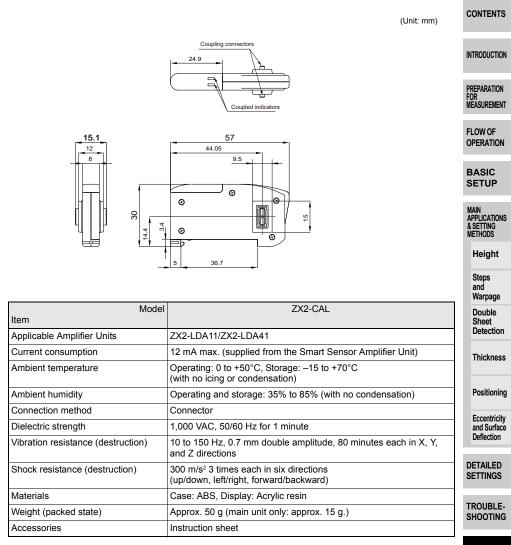
SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

Calculating Unit

ZX2-CAL



SPECIFI-CATIONS

INDEX

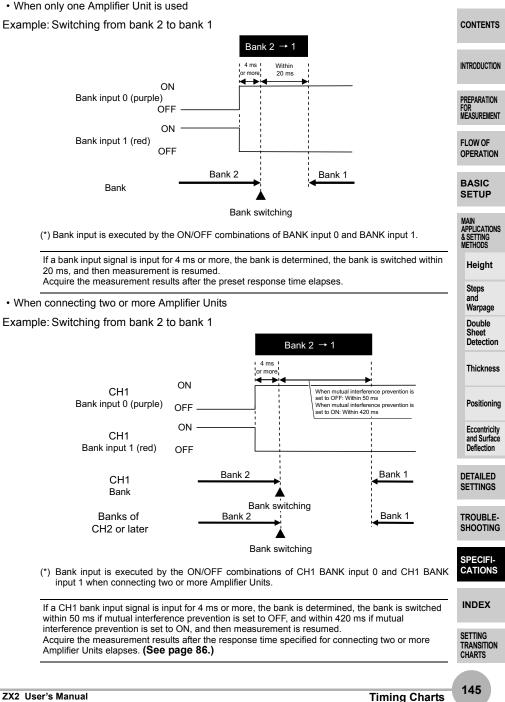
Timing Charts

CONTENTS

This section explains the timing charts for the I/O signals that are exchanged between the Controller and external devices.

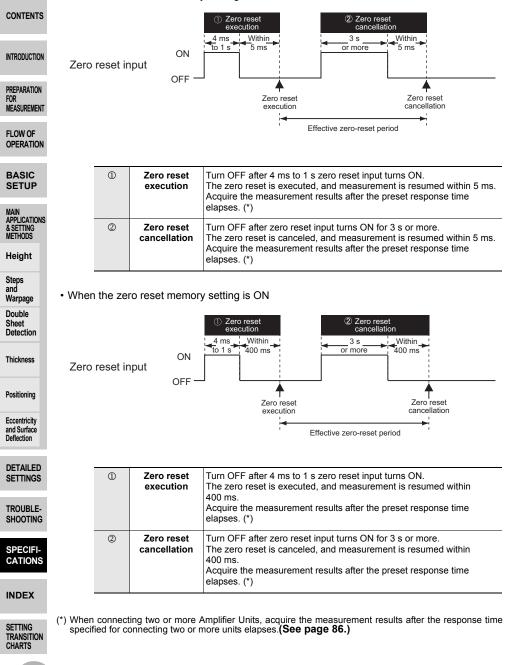
Laser OFF input INTRODUCTION Laser emission ON→OFF (2) Laser emission OFF→ON PREPARATION 4 ms____ Within 4 ms Within FOR 8 ms (*) 20 ms (*) MEASUREMENT or more or more ON Laser OFF input FLOW OF OFF OPERATION ON BASIC Laser emission SETUP OFF MAIN APPLICATIONS Laser emission 1 If laser OFF input is ON for 4 ms or more, the signal is received, and & SETTING $ON \rightarrow OFF$ laser emission is turned OFF within 8 ms. METHODS 2 Laser emission If laser OFF input is OFF for 4 ms or more, the signal is received, and Heiaht $OFF \rightarrow ON$ laser emission is turned ON within 20 ms. Steps (*) The value is within 150 ms when mutual interference prevention is set to ON. and Warpage Reset input Double Sheet Detection ② Output value Output value reset cancellation reset execution 4 ms Within or more 4 ms (*1) Thickness 4 ms or more ON Reset input Positioning OFF Eccentricity and Surface Deflection Effective reset period DETAILED SETTINGS 1 Output value If reset input is ON for 4 ms or more, the signal is received, and output reset execution is reset within 4 ms. TROUBLE-2 Output value If reset input is OFF for 4 ms or more, measurement is resumed. SHOOTING reset Acquire the measurement results after the preset response time cancellation elapses. (*2) SPECIFI-(*1) The value is within 150 ms when mutual interference prevention is set to ON. CATIONS (*2) When connecting two or more Amplifier Units, acquire the measurement results after the response time specified for connecting two or more units elapses. (See page 86.) Note. • When the hold function is not used INDEX The output while a reset signal is being input is held in accordance with the output during nonmeasurement setting. When the hold function is used SETTING If a reset signal is input, the state in effect before the hold function was set will be restored. TRANSITION (For details on the hold function, see page 93, and for details on the output during CHARTS non-measurement, see page 111.) 144 ZX2 User's Manual Timing Charts

Bank input



Zero reset input

· When the zero reset memory setting is OFF

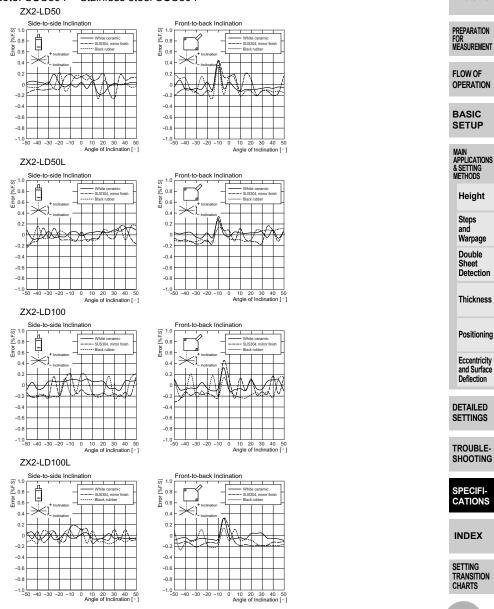


146

Engineering Data (Reference Value)

Angle Characteristic

The angle characteristic is a plot of the inclination of the sensing object in the measurement range and the maximum value of the error to analog output. Note: SUS304 = Stainless steel SUS304



CONTENTS

INTRODUCTION

ZX2-LD50V

CONTENTS

INTRODUCTION

PREPARATION

MEASUREMENT

FLOW OF

BASIC

SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps

Warpage

Double

Sheet

Detection

Thickness

Positioning

Eccentricity

and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

-3.0

-4

-- FAR side -- 4

nent (mm

NEAR side

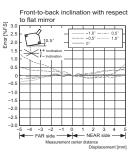
Measurement center distance Displace

and

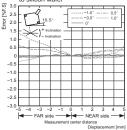
OPERATION

FOR

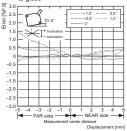




Front-to-back inclination with respect to silicon wafer

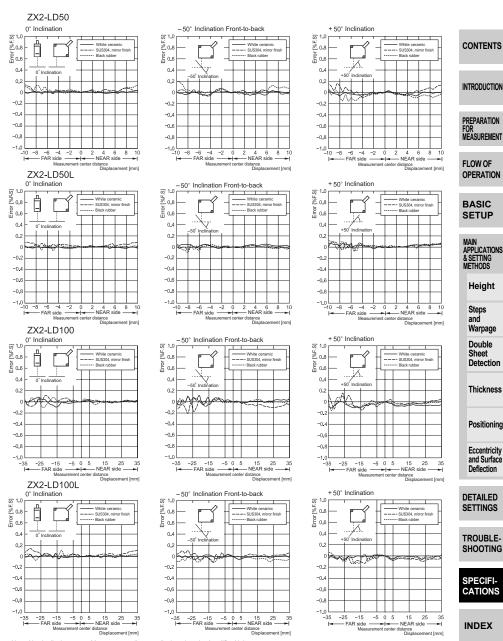


Front-to-back inclination with respect to glass





Linearity Characteristic for Different Materials



Note. X axis displacement: Measurement distance displayed on the Amplifier Unit For the measurement distance displayed on the Amplifier Unit, the measurement center distance is displayed as 0, and the NEAR and FAR sides from the sensor are displayed by + and -, respectively.

149

SETTING

TRANSITION CHARTS

Linearity Characteristic for Different Materials

CONTENTS

ZX2-LD50V 0° Inclination

[S: 1.0 [S: 4]% 0.8

0.6

0.4 0.2

0 -0.2 -0.4

-0.6

-0.8

-10

н - FAR side ·

-4 -2 -1

Beam Size

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

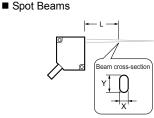
MAIN APPLICATIONS & SETTING METHODS

Height

Steps and

Warpage Double Sheet Detection

Thickness



Flat mirro

Glas

- NEAR side -

side ______ Measurement center distance Displacement [mm]

-

Silicon wafe

ZX2-LD50

| L | +10 mm | 0 mm | -4 mm | –10 mm |
|---|-------------------|-------------------|------------------|-------------------|
| х | Approx. 600 µm | Approx. 160 µm | Approx. 40 µm | Approx. 220 µm |
| Y | Approx. 350 µm | Approx. 90 µm | Approx. 60 µm | Approx. 130 µm |

ZX2-LD100

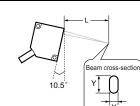
| Positioning | L | +35 mm | 0 mm | –20 mm | –35 mm |
|-------------------------------------------|---|-------------------|-------------------|-------------------|-------------------|
| | х | Approx. 1.1 mm | Approx. 400 µm | Approx. 70 µm | Approx. 250 µm |
| Eccentricity and Surface Deflection | Y | Approx. 550 µm | Approx. 190 µm | Approx. 110 µm | Approx. 150 µm |

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-

INDEX



CATIONS ZX2-LD50V

| L | +5 mm | 0 mm | -4.2 mm | –5 mm |
|---|-------------------|-------------------|------------------|------------------|
| Х | Approx. 350 µm | Approx. 160 µm | Approx. 40 µm | Approx. 50 µm |
| Y | Approx. 180 µm | Approx. 90 µm | Approx. 60 µm | Approx. 70 µm |

SETTING TRANSITION CHARTS

| –5 mm | | |
|------------------|----------|------------------------|
| Approx. 50 µm | Note. L: | Measureme Amplifier |
| Approx. | | distance di |

ent distance displayed on the Unit (For the measurement isplayed on the Amplifier Unit, urement center distance is displayed as 0, and the NEAR and FAR sides from the sensor are displayed by + and -, respectively.)

Line Beams

Note. X axis displacement: Measurement distance displayed on

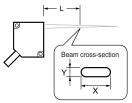
the measurement center distance is displayed as 0,

For the measurement distance displayed on the Amplifier Unit,

and the NEAR and FAR sides from the sensor are displayed by

the Amplifier Unit

+ and -, respectively.



7X2-I D501

| L | +10 mm | 0 mm | -4 mm | –10 mm |
|---|-------------------|-------------------|-------------------|-------------------|
| Х | Approx. 2.6 mm | Approx. 2.6 mm | Approx. 2.6 mm | Approx. 2.6 mm |
| Y | Approx. 350 µm | Approx. 90 µm | Approx. 60 µm | Approx. 130 µm |

ZX2-LD100L

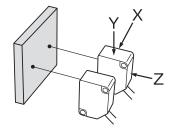
| L | +35 mm | 0 mm | –20 mm | –35 mm |
|---|-------------------|-------------------|-------------------|-------------------|
| Х | Approx. 2.1 mm | Approx. 2.5 mm | Approx. 2.7 mm | Approx. 2.9 mm |
| Y | Approx. 550 µm | Approx. 190 µm | Approx. 110 µm | Approx. 150 µm |

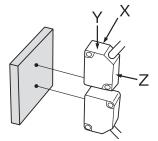
Reference: Distance between two diffusereflective models that causes malfunction when mutual interference prevention is turned off

The distance at which the resolution exceeded the rated value when sensors were moved towards each other (in all the X, Y, and Z directions) while mutual interference prevention was turned off was measured. (Workpiece: white ceramic; positioned facing the sensor, not on an angle.)

Horizontal direction

Vertical direction





Results: For all models, the distance that causes malfunction is 0 mm in all the X, Y, and Z directions.

Note. The above result was obtained when the white ceramic workpiece was positioned facing the sensor, not on an angle.

Note that mutual interference can occur when using different types of workpieces or when the sensors are attached at an angle, so it is recommended to use the sensors with mutual interference prevention turned on.

Thickness Positioning

Sheet Detection

CONTENTS

INTRODUCTION

PREPARATION FOR MEASUREMENT

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS Height Steps and Warpage Double

> Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

CONTENTS

INTRODUCTION

PREPARATION For Measurement

FLOW OF OPERATION

BASIC SETUP

MAIN APPLICATIONS & SETTING METHODS

Height

Steps and Warpage

Double Sheet Detection

Thickness

Positioning

Eccentricity and Surface Deflection

DETAILED SETTINGS

TROUBLE-SHOOTING

SPECIFI-CATIONS

INDEX

SETTING TRANSITION CHARTS

152

INDEX

Numerics $(. .5^{\prime\prime} (analog output 1 to 5 V) 109$ 2-sensor operation (thickness) 60 2-sensor operation (A-B) 50 $(.20^{\prime}MR (analog output 4 to 20 mA) 109$ $-5 ..5^{\prime\prime} (analog output \pm 5 V)$ 109 Symbols (sub-display memory resolution) 84

Α

| R-b (2-sensor operation A-B) Active Smart Tuning Amplifier Unit | 50 83 |
|-----------------------------------------------------------------------|----------|
| Connecting the Sensor Head | |
| to the Amplifier Unit | 28 |
| Connecting Two or More | 20 |
| Amplifier Units | 86 |
| Installing | 25 |
| Part Names and Functions | 19 |
| Specifications and | |
| Dimensions | 136 |
| ANALOG (sub-display memory | |
| analog output value) | 84 |
| Analog Output | 109 |
| Angle Characteristic | 147 |
| 유-미니는 (analog output) mark | 109 |
| $R\nu E$ (hold measured value aver 44, 54, 62, 76 | |

В

| BANK (bank switching | j) 100, 119 |
|----------------------|----------------|
| Bank Setting | 99 |
| Bank Switching | 100, 119 |
| Basic Configuration | 18 |
| BASIC SETUP | 40 |
| Beam Size | 139, 140, 150 |
| 60논문입M (hold minim | um value) |
| 44, : | 54, 62, 76, 94 |

С

D

Е

| ERLE (2-sensor operation) | | CONTENTS |
|----------------------------------------------------------|------------|-----------------------------------|
| | , 60 | |
| Calculating Unit Connecting | 26 | INTRODUCTION |
| Part Names and Functions Specifications and | 22 | PREPARATION For Measurement |
| Dimensions Canceling the Key Lock | 143 122 | |
| ELAMP (output for non-measure | ment | FLOW OF OPERATION |
| clamp/clamp value) Clamp value Connecting | 112 112 | BASIC SETUP |
| Calculating Unit | 26 | MAIN APPLICATIONS |
| Sensor Head and Amplifier Unit | 28 | & SETTING |
| Connecting the Sensor Head | 20 | METHODS |
| to the Amplifier Unit | 28 | Height |
| | _ | Steps |
| Default Settings | 123 | and Warpage |
| Default Value | 123 | Double |
| 러든는위 L (detail menu display) | | Sheet Detection |
| 42, 48, 52, 58, 66, 72, 88, | | |
| 93, 99, 102, 105, 111, 114, 118, 120 | 117, | Thickness |
| delect | 121 | |
| Detection Surface Selection | 120 | Positioning |
| | 117 | Eccentricity |
| Differential function | 116 | and Surface Deflection |
| Display of RUN Mode | 40 | |
| Double Sheet Detection | 52 | DETAILED |
| | | SETTINGS |
| E-BRGE (saturated light amount | nt in- | TROUBLE- |
| tensity, measurement error | .) | SHOOTING |
| | 130 | |
| E ⁻ EH (two amplifier unit | | SPECIFI- CATIONS |
| communication error) | 130 | GATIONO |
| E-d用RK (insufficient light am intensity, measurement err | | INDEX |
| | 130 | SETTING |
| E-HERd (sensor head error) 130, | 131 | TRANSITION CHARTS |
| 150, | 101 | |
| | | 153 |

| CONTENTS | E - MEM (amplifier unit memory error) Engineering Data (Reference Value) | 131 |
|----------------------------------------------|-----------------------------------------------------------------------------------|--------------------|
| CONTENTS | Angle Characteristic Beam Size Linearity Characteristic for | 147 150 |
| INTRODUCTION | Different Materials Error Messages | 149 130 |
| PREPARATION For Measurement | E-SHRE (judgment output short-circuit error) | 131 |
| FLOW OF OPERATION | E - 535 (amplifier unit system e | error) 131 |
| DAGIO | External Input | 118 |
| BASIC SETUP | EXE-I N (external input) | 118 |
| MAIN APPLICATIONS & SETTING METHODS | F FIRST (detection surface selection FIRST) FLOW OF OPERATION | 120 36 |
| Height | H | |
| Steps and Warpage | H GH (sub-display memory HIGH threshold) | 84 |
| Double Sheet | Hold 44, 54, 62, 75 | 5, 93 |
| Detection | HOLd (hold) 44, 54, 62, 75 | 5, 94 |
| Thickness | H坮与 (hysteresis width) Hysteresis width | 92 91 |
| Positioning | I I/O Circuit Diagrams | |
| Eccentricity and Surface Deflection | NPN Amplifier Unit PNP Amplifier Unit | 33 34 |
| DETAILED SETTINGS | INLE (initialization) Initialization Installing | 124 123 |
| TROUBLE- SHOOTING | Amplifier Unit Sensor Head | 25 23 |
| SPECIFI- CATIONS | ドモビア (output for non-measure keep) Key Lock Function | ment 112 122 |
| INDEX | $K - L \square \Box K$ (key lock enabled) | 122 |
| SETTING TRANSITION CHARTS | L LddDWN LD-OFF input | 132 31 |
| 154 | | |

| | Linearity Characteristic for Different Materials | 149 |
|---|-----------------------------------------------------|--------------|
| | LOW threshold) mark | 84 |
| М | | |
| | Main Display | 19, 20 |
| | ^{M⊟} X (clamp value MAX) | 112 |
| | MRX (detection surface selec | tion |
| | MAX) | 120 |
| | Measuring Eccentricity and | 70 |
| | Surface Deflection Measuring Height | 72 42 |
| | Measuring Thickness | 57 |
| | Multi Smart Tuning | 82 |
| | Mutual Interference Preventio | n |
| | 48, | 58, 88 |
| 0 | | |
| | OFF-delay timer | 114 |
| | DFF,EI M (OFF-delay timer) | 114 |
| | ON-delay timer | 114 |
| | 미시니 M (ON-delay timer) mai | rk 114 |
| | Output for Non-measurement | 111 |
| Ρ | | |
| | Part Names and Functions | 18 |
| | Amplifier Unit | 19 |
| | Calculating Unit Sensor Head | 22 22 |
| | | 22 |
| | PERK (hold peak) | 70 04 |
| | 44, 54, 62, Positioning | 76, 94 66 |
| | PREPARATION FOR | 00 |
| | MEASUREMENT | 17 |
| | P E P (hold peak-to-peak) | |
| | 44, 54, 62, | |
| Q | | |
| | Q&A | 133 |
| R | | |
| | REAL (sub-display memory | |
| | current value) mark | 84 |

RSE.OUE

(output for non-measurement) 112

S

5 I-RFL (scaling S1-Aft) 69, 74, 106, 107 5 I-BEF (scaling S1-Bef) 69, 74, 106, 107 52-RFE (scaling S2-Aft) 70.75.107 52-66F (scaling S2-Bef) 70, 75, 107 SAMPLE (hold sample) 44. 54. 62. 76. 94 SERLE (scaling) 68, 74, 105 Scaling 68, 74, 105 SELF-d (self-trigger self-d) 45, 55, 63, 77, 96 5ELFLV' (self-trigger level) 45, 55, 63, 77, 97 SELF-U (self-trigger self-u) 45, 55, 63, 77, 96 Sensor Head Part Names and Functions 22 Specifications and Dimensions 138 Sensor Head extension cable 142 Sensor Heads 23 Installing Setting Transition Charts 158 Simplest Setting 40 Single Smart Tuning 40, 43, 49, 53, 59, 68, 73, 81 Smart Tuning 40, 43, 49, 53, 59, 68, 73, 80 SMARE, ACELVE 83 SMARE/MULEI 82 SMARE/SI NGLE 40, 43, 49, 53, 59, 68, 73, 81 Specifications and Dimensions Amplifier Unit 136 Calculating Unit 143 Sensor Head 138 SPEEd (response time)

| 43, 48, 53, 58, 67, 73, 80, 84 Steps and Warpage 47 | |
|---------------------------------------------------------------------------------|----------------------------------------------|
| 5니놉MEM (sub-display memory) 84 | |
| Sub-display19, 20Sub-display memory84 | CONTENTS |
| 5님NE (mutual interference prevention) 48, 58, 89 | INTRODUCTION |
| EHI EK (2-sensor operation | PREPARATION FOR MEASUREMENT |
| thickness) 60 Threshold Setting 46, 50, 56, 64, 71, 78 | FLOW OF OPERATION |
| Timer 114 <i>EI MI N</i> [(self-trigger timing input) 45, 55, 63, 77, 96 | BASIC SETUP |
| Timing Charts 144 Timing input 97, 119 | MAIN APPLICATIONS & SETTING METHODS |

т

 EI MRSE (timing input/reset input)
 119

 ERI II (self-trigger)
 44, 54, 63, 76, 96

 Troubleshooting
 128

 EUNI NG/ REEL VE
 83

 EUNI NG/MULEI
 82

 EUNI NG/SI NGLE
 40, 43, 49, 53, 59, 68, 73, 81

W Wiring Diagram Wiring Input/Output Cables

| 7 | |
|------------------------------|------|
| Zero Reset | 101 |
| Zero reset cancellation | 104 |
| ZRJI SP | |
| (display setting at zero res | set) |
| | 103 |
| ZRMEM (zero reset memory) | 102 |

Height

Steps

Warpage

Double

Detection

Thickness

Positioning

Eccentricity

and Surface

Deflection

DETAILED

SETTINGS

TROUBLE-

SHOOTING

SPECIFI-

CATIONS

INDEX

SETTING TRANSITION

CHARTS

30

30

Sheet

and

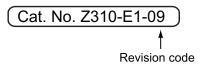
CONTENTS

INTRODUCTION PREPARATION For Measurement FLOW OF OPERATION BASIC SETUP MAIN APPLICATIONS & SETTING METHODS Height Steps and Warpage Double Sheet Detection Thickness Positioning Eccentricity and Surface Deflection DETAILED SETTINGS TROUBLE-SHOOTING SPECIFI-CATIONS INDEX

SETTING TRANSITION CHARTS

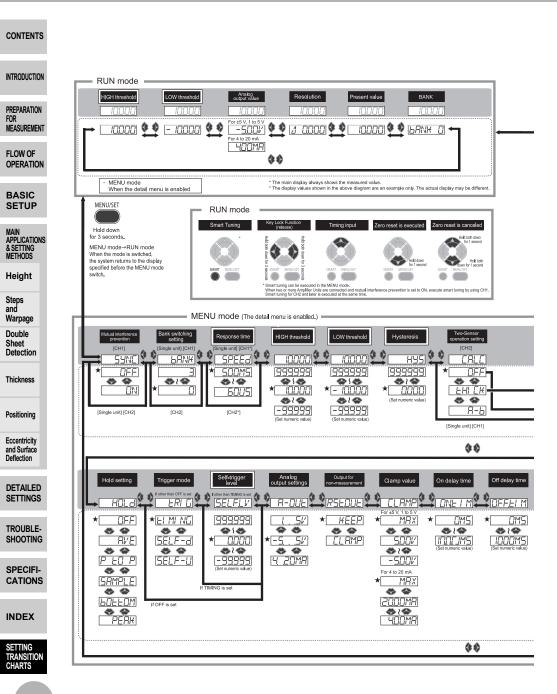
156

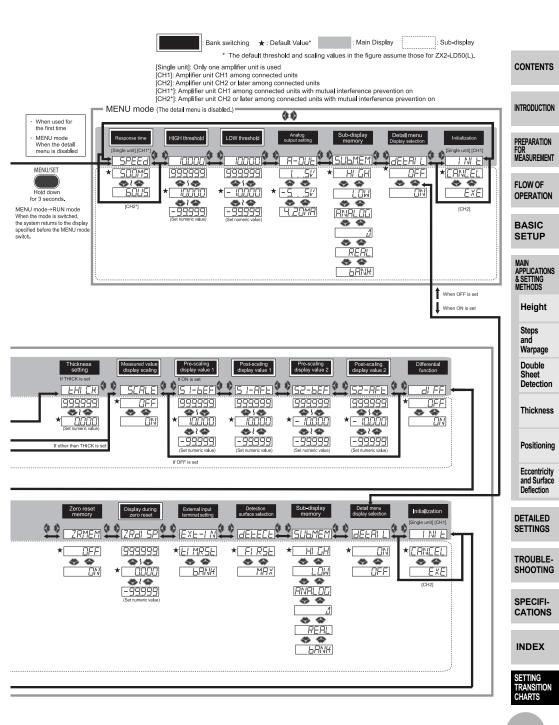
A manual revision code appears as a suffix to the catalog number at the bottom of the front and back covers of this manual.



| Revision code | Date | Revised contents |
|---------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 01 | Oct. 2010 | Original production |
| 02 | Jan. 2011 | General revision (calculating unit launched) |
| 03 | Apr. 2011 | General revision (differential function and detection surface selection function added) |
| 04 | Jul. 2011 | Revision (regular-reflective model launched) |
| 05 | Dec. 2011 | Minor corrections |
| 06 | Nov. 2013 | Pages 5 to 7: Updated terms and conditions agreement. Page 10: Changed information on FDA standards. Page 137: Changed specification of power consumption. Page 138: Changed L and A values for ZX2-LD100 (L). Page 139: Changed information on FDA standards. Page 140: Changed information on FDA standards and changed specification of accessories. Page 141: Revised dimensions of E39-L178/L179 Mounting Brackets. Page 147: Changed "Typical" to "Reference Value." |
| 07 | Mar. 2015 | Pages 26 and 86: Corrected channel designations for formula in figure. Page 50: Added sentence at top right of page. Page 136: Added callouts to figure. Page 138: Changed figure at bottom of page. Pages 139 and 140: Added material for screw sections. |
| 08 | July 2015 | Page 11: Added applicable standards. Corrected mistakes. |
| 09 | November 2018 | Page 6: Updated terms and conditions agreement. Page 90, 119 and 137: Added notes on mutual interference prevention. |

SETTING TRANSITION CHARTS





OMRON Corporation **Industrial Automation Company** Kyoto, JAPAN

Contact: www.ia.omron.com

Regional Headquarters OMRON EUROPE B.V. Sensor Business Unit

Carl-Benz-Str. 4, D-71154 Nufringen, Germany Tel: (49) 7032-811-0/Fax: (49) 7032-811-199

OMRON ASIA PACIFIC PTE. LTD.

Ownov Asia Pacific PTE, LTD. No. 438A Alexandra Road # 05-05/08 (Lobby 2), Alexandra Technopark, Singapore 119967 Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON ELECTRONICS LLC

2895 Greenspoint Parkway, Suite 200 Hoffman Estates, IL 60169 U.S.A. Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

OMRON (CHINA) CO., LTD. Room 2211, Bank of China Tower, 200 Yin Cheng Zhong Road, PuDong New Area, Shanghai, 200120, China Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2220

Authorized Distributor:

© OMRON Corporation 2010-2018 All Rights Reserved. In the interest of product improvement, specifications are subject to change without notice.

Cat. No. Z310-E1-09